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COMMITTEE ON MILK AND CREAM REGULATIONS.

REPORT

OF THE

DEPARTMENTAL COMMITTEE

APPOINTED BY THE

BOARD OF AGRICULTURE

TO INQUIRE AND REPORT UPON THE DESIRABILITY OF

REGULATIONS,

Under Section 4 of the Sale of Food and Drugs Act, 1899,

FOR

MILK AND CREAM,

WITH

COPY OF THE MINUTE APPOINTING THE COMMITTEE.

Presented to both Houses of Parliament by Command of His Majesty.

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MINUTE OF APPOINTMENT.

The Board propose to appoint a Departmental Committee to enquire and report as to what regulations, if any, may with advantage be made by the Board of Agriculture under section 4 of the Sale of Food and Drugs Act, 1899, for determining what deficiency in any of the normal constituents of genuine milk or cream, or what addition of extraneous matter or proportion of water, in any sample of milk (including condensed milk) or cream, shall for the purposes of the Sale of Food and Drugs Acts, 1875 to 1899, raise a presumption, until the contrary is proved, that the milk or cream is not genuine.

The Board further propose that the Committee consist of the following gentlemen, viz.:—

Lord Wenlock, G.C.S.I., G.C.I.E., Chairman.
Mr. George Barham.
Mr. George Cowan.
Major Patrick George Craigie, an Assistant Secretary of the Board of Agriculture.
Mr. S. W. Farmer.
Mr. Shirley F. Murphy.
Professor Thorpe, F.R.S., Principal Chemist of the Government Laboratories
and Mr. J. Augustus Voelcker, Ph.D.

Mr. Robert Henry Rew, of the Board of Agriculture, will act as the Secretary to the Committee.

Approved and Ordered,
WALTER H. LONG,
President of the Board of Agriculture.

29th January 1900.

4573. Wt. 27452. 1,500—3/01. Wy. & S.

REPORT.

TO THE PRESIDENT OF THE BOARD OF AGRICULTURE.

Sir,

1. This Committee was appointed by Minute of the 29th January 1900 to enquire and report as to what regulations, if any, may with advantage be made by the Board of Agriculture under Section 4 of the Sale of Food and Drugs Act, 1899, for determining what deficiency in any of the normal constituents of genuine milk or cream, or what addition of extraneous matter or proportion of water, in any sample of milk (including condensed milk) or cream, shall for the purposes of the Sale of Food and Drugs Acts, 1875 to 1899, raise a presumption, until the contrary is proved, that the milk or cream is not genuine. The Reference

2. In view of the fact that a Departmental Committee had previously been appointed by the President of the Local Government Board to enquire into the use of preservatives and colouring matters in the preservation and colouring of food, the Committee did not deem it necessary to pursue an investigation similar to that which was then, and is still, in progress. So far, therefore, as the "extraneous matter" mentioned in the terms of their Reference may be held to apply to preservatives or colouring matter added to milk or cream they have not thought it their duty to make any recommendation.

3. The Committee held 15 sittings for the purpose of taking evidence. The number of witnesses examined was 49, of whom 15 were analysts, 17 were dairy farmers, and 12 were representative milk traders and distributors. The analysts included the President and Honorary Secretary of the Society of Public Analysts, a representative of the Incorporated Society of Medical Officers of Health, the public analysts for Edinburgh, Dublin, Birmingham, Sheffield, Kensington, Dundee, Reading and Leicestershire, and the analysts to the British Dairy Farmers' Association, the Dairy Trade Protection Society, the Edinburgh Dairy Keepers' Association, and the Aylesbury Dairy Company. Some of these witnesses combined the position of Medical Officer of Health with that of Public Analyst, and in addition the Committee heard evidence from the Medical Officers of Health for Glasgow and Manchester, the latter representing the Association of Municipal Corporations. The views of those concerned in the distribution of milk were fully presented not only by three of the analysts above mentioned, who were directly nominated as witnesses on behalf of the dairy trade, but also by the representatives of the Metropolitan Dairymen's Society, the Glasgow Dairymen's Association, the Manchester and Salford Milk Dealers' Association, the Liverpool and District Dairymen's Association, the Condensed Milk Defence Association, and the Glasgow Dairy Company, as well as by wholesale milk dealers and proprietors and managers of dairy factories. Among the witnesses who attended to present the views of milk-producing farmers were representatives of the British Dairy Farmers' Association, the Central Association of Dairy Farmers, the Central Chamber of Agriculture, the Highland and Agricultural Society of Scotland, the Scottish Chamber of Agriculture, the Cheshire Milk Producers' Association, the Northumberland and Durham Dairy Farmers' Association, the Derbyshire Dairy Farmers' Association, the Gloucestershire, Somerset and Bristol Dairy Farmers' Society, the Evercreech and Mid-Somerset Agricultural Society, the Wigtownshire Dairy Farmers' Association, the Wigtownshire Dairy Association, the Eastern Counties Dairy Farmers' Co-operative Society, and the East Suffolk Chamber of Agriculture. A witness nominated by the Royal Agricultural Society, and two or three typical dairy farmers also gave evidence individually. Among other witnesses heard were Sir Witnesses.

George Brown, C.B.; Mr. N. Story Maskelyne, F.R.S., and the Chairman of the Sanitary Inspectors' Association, while the Committee received valuable evidence relating to the subject of milk analysis from Mr. G. Lewin, one of the superintending analysts of the Inland Revenue branch of the Government Laboratory.

DIVISIONS OF ENQUIRY.

4. The subject of enquiry naturally divided itself under four headings, relative to:—

(*a.*) Milk (*i.e.*, whole or full milk).
(*b.*) Skimmed (or separated) milk.
(*c.*) Condensed milk, and
(*d.*) Cream.

To some extent these overlapped, and witnesses were in many cases able to give evidence in regard to more than one of these commodities, but it was at once apparent that there were considerations affecting each which were distinct, and that conclusions arrived at with reference to one of them did not necessarily apply to others. It will be convenient therefore to consider them as distinct articles of commerce to be dealt with independently.

MILK.

IMPORTANCE OF MILK SUPPLY.

5. It is not necessary to point out the great importance of the milk supply of the country, the vastness of its amount, the serious considerations—from the point of view of the public health—attaching to its quality, and the magnitude of the commercial interests involved in its production, distribution and sale. These are elementary facts which no evidence was required to prove to the Committee. Nor were the difficulties of the task entrusted to them less obvious to the Committee, although their appreciation of them could not fail to be strengthened by the opinion expressed by many of the witnesses that the problem was one which well-nigh defied perfect solution.

DIFFICULTIES OF PROBLEM.

The Necessity for Regulations.

6. By the terms of their reference the Committee were bound in the first instance to satisfy themselves whether any regulations under Section 4 of the Food and Drugs Act, 1899, were desirable. They were instructed to report what regulations, *if any*, the Board of Agriculture might with advantage make.

7. The view that no such regulations were necessary was expressed by several witnesses, including some of the chief representatives of the dealers in, and distributors of, milk.

Thwaite, 6802–3, 6890, 6930–59.

8. Mr. Thwaite, who appeared on behalf of the Metropolitan Dairymen's Society, stated that the Society did not advocate a fixed "standard" for milk, but that it should be that of purity as from healthy, well-fed cows When, however, it was pointed out to him by the Chairman that a "standard" of some sort might be necessary to ensure the attainment of his ideal—that no action could be taken against an adulterated milk unless upon definite grounds based on an examination of its composition—he admitted that the question was one of great difficulty, and made a personal suggestion —without committing his Society—that some method of administration embodying the idea of taking proceedings upon the average of a number of samples, rather than one sample, might be adopted. He stated that in his own business he aimed at obtaining 3·8 per cent. of fat in the milk delivered to his customers, but he also said that there might be cases in which perfectly pure and genuine milk would fall below 3 per cent.

De Hailes, 599–604, 613.

9. Mr. De Hailes, on behalf of the Dairy Trade Protection Society, objected to the fixing of any "standard having the force of law" on the ground of the great variation which exists in milk, and stated that he could not conceive of a "fair standard." He thought that the fixing of a "standard" "would be to the interest of the public analyst, and of a portion of the Bench," but not to the interest "either of the public or the traders themselves." Mr. Hoddinott, Managing Director of the Great Western and

Hoddinott, 7662, 7704–7709, 7885.

Metropolitan Dairies, which is the second largest wholesale firm of milk dealers in the country, said that he could not recommend any standard, and was "not satisfied" with any standards suggested to him, although, if a standard were adopted, he thought a variable one, according to season, would be necessary, and suggested 2·75 per cent. of fat for four months and 3 per cent. of fat for eight months with 9 per cent. solids not fat. He stated "we put in our contracts 3·5 per cent. fat, but many of the farmers cross it out, and say it is impossible to be met throughout the year." He added that his firm invariably wrote to them when they get below the 3 per cent. standard. Mr. Pocock, another wholesale milk dealer of large experience, while recognising the existence of certain "standards" at the present time in the practice of analysts and of the Government Laboratory, and admitting their necessity, as "otherwise the milk cannot be analysed," and while admitting, too, that he himself acted on the reports of his analyst in dealing with his farmers, objected to an "advertised" or "hard-and-fast standard," fixed by a public authority. If, however, a statutory limit were fixed he thought it should not exceed 2·75 per cent. fat and 8·5 per cent. solids not fat. He felt "positively sure that the public would get worse milk if we all had to work to the advertised standard."

Pocock, 1256–7, 1283.

10. Doubts as to the advisability of prescribing any official limits were expressed by Mr. W. Ashcroft, who appeared on behalf of the British Dairy Farmers' Association, and in expressing his own personal views stated that he believed they would be shared by a very large majority of the members; by Mr. R. Finney, representing the Derbyshire Dairy Farmers' Association; and by Colonel Curtis-Hayward. Sir George Brown also stated that in his opinion it is not desirable that a "standard" for milk should be fixed by regulation.

Ashcroft, 7497 Finney, 3184, Curtis-Hayward, 4140, Brown, 9857.

11. But with the exceptions above indicated, it may fairly be said that substantially the overwhelming body of evidence received by the Committee tended to support the view that the setting up of some statutory limits for milk is necessary, though opinions differed as to the precise regulations which it would be desirable to adopt.

12. The Committee desire to give due weight to the views of witnesses, such as those above-mentioned, who urged the advisability of doing nothing; but a consideration of their evidence leads to the conclusion that the arguments which they advanced do not go to the root of the matter. The question before the Committee, in fact, scarcely admits of a discussion of the principle of statutory limits for milk. It is possible, no doubt, to argue that the whole structure of the Food and Drugs Acts rests on a wrong basis, and that—as one or two witnesses apparently held—the public might safely be left to look after themselves, the pressure of competition being relied upon to induce purveyors of milk to vie with each other in selling the highest quality. Mr. Thwaite observed that he did not consider the consumer wanted protecting; competition, he thought, was too keen. But whatever may be said for or against this contention, it suffices for the purposes of the Committee that it has not prevailed with the Legislature. The assumption of the law is that the maintenance of the genuineness of milk supplied to the public cannot be left entirely to the honesty of vendors and the enlightened self-interest of consumers.

Thwaite, 6948.

13. Although, strictly speaking, it did not lie within the scope of the Committee to establish this proposition, many witnesses referred to the fact that the adulteration of milk still largely prevails, and that so far from a policy of doing nothing being desirable, it is important that the administration of the law should be still more stringent than at present. Especially is this the case in view of the ease and readiness with which large quantities of separated milk, obtained by methods of comparatively recent invention, may now be made use of in what is called "toning down" the milk supply. It is difficult, therefore, to accept the statement that the stress of competition affords sufficient security when it fails, even when supplemented by the law, to have any such effect.

Hill, 23–7. Allen, 4483.

14. Unless therefore it be held that the Food and Drugs Acts are, as regards the sale of milk, unnecessary, it is difficult to escape from the conclusion that some limits should be fixed. It is clear that unless prosecutions were to be confined only to those cases where the physical act of adulteration can be proved by direct evidence, they must be founded upon the analytical examination of the milk. But the addition either of water or of skimmed (or separated) milk cannot be determined absolutely, but can only be inferred from the fact, broadly speaking, that the proportion of particular constituents differs from that normally to be found in milk. Similarly the abstraction of cream (either directly or by withholding the "strippings") or, what comes to the same thing, the addition of separated milk, can only be detected relatively by the deficiency of fat in the sample examined as compared with the normal amount in whole milk. In short, as Mr. Pocock said, "the milk cannot be analysed"—in other words, its analysis for the purpose of discovering adulteration is nugatory—except by reference to limits of some kind.

A "STANDARD" UNDER THE ACT.

15. Granting, therefore, that it is imperative that a standard implying limits should exist, the practical question arises as to the desirabilty of fixing such by regulation of the Board of Agriculture. Before considering this, however, it may be well to define what, in the view of the Committee, is the exact meaning of a standard or limit within the meaning and for the purposes of Section 4 of the Food and Drugs Act, 1899. The word "standard" has been for many years so widely used in this connection and was so commonly employed by witnesses before this Committee, that the adoption of any more precise substitute for it is attended with difficulty. But taken literally it is not only inaccurate, but may be misleading, when applied to the new conditions arising under the Act of 1899. The Regulations which, in accordance with Section 4, the Board of Agriculture may make, are in effect to prescribe the point at which it may be reasonably presumed, in the absence of proof to the contrary, that milk is adulterated. That point, in whatever terms it may be expressed, must clearly be not a "standard," in the strict sense of the term, but a minimal limit. The word "standard" is not to be understood, then, as meaning the degree of quality which milk vendors must merely aim at reaching, but as one below which the article they deal in should not fall. Whenever, therefore, the term "standard" is used by the Committee in this Report, it is to be understood in this sense. Several of the scientific witnesses, it may be added, preferred the word "limit" to "standard."

Dyer, 328–9,
Fisher, 3749,
Allen, 4489,
Lloyd, 6044.

16. This restriction by the Statute of the possible scope of the regulations bears directly upon the question of the desirability of fixing minimal limits. The objections raised by some witnesses to the fixing of an official standard arose partially from the misconception that there would be on the whole less elasticity, so to speak, than under the present condition of affairs. It seems clear that there is nothing in the Section to require that this should be the case, or that an innocent man against whose milk the presumption of adulteration might be raised, would run any greater risk of conviction or have less opportunity of clearing himself than at present. The Committee, indeed, are of opinion that under the provisions of the Act of 1899, as intelligently administered by a local authority, the position of the innocent vendor should be better safeguarded now than formerly, and that in consequence a relatively higher minimal limit—one more nearly approximating to the normal quality of milk—may reasonably be demanded.

Dyer, 335, Fisher,
3714, 3982, 8841,
Lewin, 10554.

17. Moreover, it would seem to be obviously desirable that all concerned should have no doubt as to the limits by which they will be judged. Since the limit of fat adopted by the Government Laboratory in analysing reference samples has been raised to 3 per cent. and coincides with that employed for some years past by many members of the Society of Public Analysts, a considerable advance in the direction of uniformity has doubtless been made, but it still lies in the discretion of each public analyst to adopt any limit he may think best. Evidence was produced to show that there is in fact considerable divergence, so that it is possible for milk to be passed as

genuine in one locality which would be condemned as adulterated in another. Mr. Beecroft, who represented the Cheshire Milk Producers' Association, stated that he had ascertained the "standard" of fat adopted in 16 different towns. At Middlesborough it is as low as 2·5 per cent., at Bradford 2·6, and in most of the others 2·75. The Committee were informed by more than one witness that in Glasgow the minimal limit was 2·75 per cent. of fat. Dr. Hill stated that in Birmingham his limit was 12 per cent. of total solids, containing not less than 3·5 per cent. of fat. In fact, the general effect of the evidence was to show that there is very considerable divergence in the actual limits adopted, and perhaps even more in their precise application. Public analysts take, as might be expected, differing views as to the strictness with which they should, so to speak, draw the line at which the presumption of adulteration begins; local authorities, although as a rule accepting the advice of the public analysts, are in some instances disposed to follow their own views as to what fair limits may be; and magistrates having frequently conflicting evidence before them, and being without what they deem to be authoritative guidance, are prone to dismiss cases altogether or to exercise their own judgment as to the normal constitution of genuine milk. Under these circumstances it is inevitable that the administration of the law should be hampered, and that considerable uncertainty as to their position should prevail among those concerned. It seems, in short, difficult to understand that any advantage can arise by reason of the so-called "standard" or "standards," being uncertain, varying, and not specifically laid down by a central authority.

Beecroft, 887, Chalmers, 3457, 3795, Stirling, 1972, Kennedy, 2086, Hill, 19, Allen, 4509, King, 5365, 5603

18. It may be argued that definite minimal limits are, to all intents and purposes, determined by the practice of the Government Laboratory. By Section 21 of the Food and Drugs Act, 1899, the power of the Bench under the Act of 1875 to send samples to the Government Laboratory for analysis has been extended, so that now the magistrates may do so on their own initiative, and if either party makes the request they are bound to do so. This may further extend the influence which the limits adopted at the Government Laboratory have exerted, and must necessarily exert, on the practice of analysts and the decisions of magistrates throughout the country. But the limits in use at the Government laboratory necessarily depend upon, or are affected by, the personal views of the head of the department, for the time being, and may therefore be changed from time to time. They only come directly into effect in the case of reference samples, and although undoubtedly they are commonly brought to the notice of the Bench in other cases, and may be taken into account, magistrates may, and sometimes do, consider that they are not in evidence, or that they have no authoritative value, and may therefore decline to consider them. The position in Edinburgh was forcibly brought before the Committee by Mr. Falconer King. He said that, in that city, "If we do not have some standard fixed the Act will very soon become a dead letter as far as milk is concerned, because our sheriffs are of opinion that unless a standard is fixed, or unless some person has seen the milk actually adulterated, or the evidence of the public analyst is totally uncontradicted, they will not convict." He added, "If we had a legal standard fixed all our difficulties would disappear and our sheriffs, I am sure, would be very well pleased." There is no doubt that this view is generally shared by public analysts throughout the country, although they may not have met with the special difficulties which appear to have arisen in Edinburgh.

62 & 63 Vict. c. 51, s. 21.
38 & 39 Vict., c. 63, s. 22.

King, 5365, 5369.

19. It is clear that if the absence of an official standard gave rise to doubts in the minds of magistrates prior to the passing of the Act of 1899, they might be expected to feel still greater hesitation if, in the face of Section 4, the Board of Agriculture after this enquiry refrained from making the regulations therein contemplated. The omission could scarcely fail to be adduced as testimony that the problem was insoluble, and the difficulty of securing convictions for the failure of a particular sample of milk to reach the standard of quality set up by the local analyst would be thus naturally increased.

20. The Committee therefore have arrived at the conclusion that some definition of minimal limits of quality for milk is necessary and that the Board of Agriculture should be advised to make regulations with that object.

Difficulties in Fixing Limits.

VARIABILITY OF MILK.

21. The difficulties in the way of setting up minimal limits of quality for milk were impressed upon the Committee at length by many witnesses. They were for the most part founded on the fact that the composition of milk is naturally subject to considerable variation, and that a number of more or less accidental or uncontrollable causes may affect its quality. While the Committee were not able always to accept the views of witnesses as to the non-preventability of some of the causes referred to, it may be at once admitted that the sensitiveness of the cow to the numerous conditions which may on occasion influence both the yield and quality of her milk is a factor to be considered in the determination of fair and reasonable limits. Among the causes of variability in milk which were specially brought under the notice of the Committee were the quality of the land, the treatment and feeding of the cows, their breed and condition, the irregularity of the intervals between times of milking, the effect of the time of year and of exceptional meteorological conditions.

LAND.

Stratton, 6515.
Hoskins, 5314–7.
Beecroft, 815, 820,
McConnell, 3161.
Pocock, 1257.
Adams, 7922.
Hoddinott, 7688,
7808–9.

22. That the quality of milk is affected by the pastures upon which cows are kept is an opinion expressed by several practical farmers, although the assertions made were not always capable of definite proof. Mr. Stratton, for instance, said that certain classes of pasture produce poor milk, and Mr. Hoskins said land differs "field to field" in the quality of milk produced. Mr. Beecroft pressed this point strongly, and stated that while he himself only kept cows on land which would give 3 per cent. of fat in milk or more, there was land in Cheshire on which, even with high feeding, it was impossible to produce 2·75 per cent. Mr. McConnell said that in Essex some of the poorest land in the county, on the millstone grit, would scarcely produce milk with 3 per cent. of fat, and in such a case he thought cows should not be kept. Mr. Pocock, who before he was a milk dealer in London had been a farmer in Berkshire, said: "We had two fields in Berkshire; one field was a feeding ground, not a mowing ground. During the time that the cows were in that field the milk was of excellent quality, and everything that one could desire. . . . But within twenty-four hours of the cows going into the very next field, which was a mowing field, down went the quality at once to a very low ebb indeed." Mr. Adams said that he knew some land produced richer milk than others, though he believed that all the farmers in his district could meet a standard of 3 per cent. of fat from March to June, and 3·25 in the other eight months. Mr. Hoddinott, however, who appeared as a milk dealer, and had previously been a farmer for many years, while contending that some men would have difficulty in maintaining the quality of their milk "because the quality of food they grow on the farm is so much inferior to that growing on richer land," added that he knew very poor land "which gives better butter fat in the summer months than land which is much richer."

23. It cannot be doubted that there must be land which is unsuited to the keeping of dairy cows, just as there is land unsuited to wheat-growing, sheep-breeding, or any other particular branch of farming. But, clearly, it would be as unreasonable to fix limits which would be applicable to milk produced from every conceivable class of land, however poor or unsuitable, as it would be to fix them in accordance with results which are possible only on the land most eminently suited for dairying purposes.

FEEDING

24. The question of pasturage resolves itself really into one of feeding generally, and upon this point the Committee received a large amount of evidence. To what extent the quality of milk is affected by the food of the cow is a moot point which has long been discussed among those interested in dairy farming. There is no doubt that an impression commonly prevails that the quality of milk is more or less determined by the nature and com

position of the food which the cow receives. It was pointed out by Mr. J. A. Smith, who is a practical farmer in Suffolk with extensive experience in matters relating to dairying, that this view is acted upon and that "farmers who produce milk for sale feed differently to what they do if they are producing for butter. . . The farmer, who is supposed to know his own business, does it advisedly. If he is feeding for butter—if he is making butter or making a cheese—he looks out for different foods." Mr. T. H. Pearce, who farms in Somerset and represented the Gloucestershire, Somerset, and Bristol Dairy Farmers' Society, said that he had found feeding make a considerable difference both in the quantity and quality of milk. Mr. F. J. Lloyd emphatically expressed a similar view. He said, "My own experience, extending now over many years, leaves me without a shadow of a doubt that the composition of milk is affected and can be affected by feeding." He mentioned an instance in which a farmer whose milk had been refused by a dealer, on account of its poverty, made, on his advice, an alteration in the feeding of the cows which had the effect of sufficiently improving the milk, although it was a month before the milk could be put on the market again, because "the cows had been improperly fed for such a long time that it took them one month to recuperate themselves before the effect of the food was felt on the milk." Mr. Lloyd added his opinion that "Most of the statistics which go to show that food has no effect on milk fail, because the experiments have not been carried far enough to counterbalance that peculiarity of the animal to first utilise the food for itself before it utilises it for the milk."

Smith, 7014.
Pearce, 5154–5.
Lloyd, 5986.

25. Mr. Drysdale, who represented the Scottish Chamber of Agriculture, and, as manager and part proprietor of the Fairfield Farming Company, farms 1,200 acres and keeps 100 milking cows in Stirlingshire, expressed the view, based on tests which he had conducted, that the improvement of the quality of milk can be helped by feeding, "not to any large extent but considerably." "I do not say," he added, "you can ever raise a 3 per cent. cow into a 5 per cent. cow by feeding, but you can affect her very considerably by judicious feeding." One or two other witnesses also expressed a belief in the influence of food on the quality of milk.

Drysdale, 4308, 4334.
Stratton, 6542.
Prideaux, 7480–1.
Hoddinott, 7688–7803.

26. On the other hand several witnesses stated that under normal conditions the effect of a change of food on the composition of the milk is practically *nil*. Sir George Brown, for example, considered that the available evidence all over the civilized world goes to show that feeding has practically little or no effect upon the milk and cannot increase the fat beyond a certain normal amount.

Brown, 9881–3.

27. Professor Long said, "You cannot improve the fat percentage of the cow by any manner or method of feeding. If a cow is normally fed, if she obtains a proper ration, then I say you cannot make her give more butter-fat in her milk. But if she is under-fed, that is to say, if she gets too small a proportion of digestible nutritious matter, or too small a proportion of either of the constituents of this matter, then she will fall away in her milk yield, or in the quality of her milk yield." Mr. Christopher Middleton, who represented the Central Chamber of Agriculture, and is a dairy farmer of large experience, expressed very much the same view. He said, "It is possible that with cows which are very poorly fed, the addition of rich food would alter the composition of their milk, but taking well-fed cows to begin with, you can have very little effect upon them then." Mr. Adams, who farms 4,000 acres in Berkshire and has a herd of 500 milking cows, also, among others, did not think that feeding affected the quality of milk from ordinarily well-kept cows.

Long, 8074.
Middleton, 2347.
Adams, 7931.

28. Sir Charles Cameron brought under the notice of the Committee the results of some tests carried out at Glasnevin with the object of determining the influence of various kinds of food, from an economical point of view, on the production of milk. He stated, however, that they were only the beginning of a long series of experiments, and that at present no conclusions could be deduced from them. He had found that "the result of the rather poor feeding was that the first effect was produced upon the weight of the animal and not upon the milk; the animal began to get thin, losing its weight, though there was not very much effect upon the quality of the milk."

Cameron, 2417 and Appendix IX.

Speir, 2695–6, and Appendix XXX.

29. The most elaborate experiments bearing on this point which wer brought before the Committee were those carried out by Mr. John Speir, who represented the Highland and Agricultural Society of Scotland, and is a well-known practical authority. These experiments are fully described in articles published by Mr. Speir in the "Transactions" of the Highland and Agricultural Society for 1896 and 1897, copies of which he laid before the Committee. In summarising the results he said, "The feeding tests are in many cases extreme from the food point of view; they were really drawn out so as to show extremes, so that if you could produce either very poor milk or very rich milk you would be able to do it under these circumstances." Asked whether his experience led him to believe that the quality of the milk can be altered by the feeding, he replied, "Not very much for any material length of time. There is a very big alteration for a limited time. During the average of my experiments the maximum seemed to work out, apparently, between the tenth and the twentieth day; after that a continuation of the same feeding brought it down between the fifth and sixth weeks, to, practically speaking, the point where you started from."

30. It is admitted that this problem of the influence of food on the quality of milk is not yet fully solved and that further experiments, scientifically conducted, are necessary before it can be considered to have been fully threshed out.* In any case, interesting and important as the question is, it is not one which the Committee are called upon to decide. If the quality of milk is not affected by a change of food, then one difficulty in the way of maintaining a uniform supply would be removed; if, on the other hand, milk may be improved by altering the feeding of the cows, it is clear that the farmer would possess a controlling power which should materially reduce the difficulty of complying with any regulations which may be laid down.

BREED OF COWS.

Curtis-Hayward, 4197.
Drysdale, 4372.
Lloyd, 5960.
Steel, 6344–7.
Walker, 7624.
Long, 8074.

31. Whatever difference of opinion may prevail as to the effect of food, there is none about the influence of breed on the quality of milk. "Feed for quantity, breed for quality" is a dictum assented to by many witnesses, and it is well understood that the average quality of the milk given by cows of different breeds varies. Professor Long, who stated that during the last 20 years he had kept Shorthorn, Jersey, Guernsey, Ayrshire, Dutch, Swiss, and Breton cows, said that in his opinion, experience and practice showed that "the only method of increasing the milking property of cows is by breeding and by selection." He added that a farmer can produce what quality of milk he likes, within reason, by the system of selection and breeding.

Middleton, 2331–6.

32. That some breeds of cows naturally produce richer milk than others is well known. The Channel Islands breeds occupy the foremost position in this respect, but as they are not largely kept by milk-selling farmers the Committee practically excluded them from consideration. For instance, Mr. Middleton presented the figures relating to the milk production of his herd of Shorthorns, but he also stated that he kept some Guernseys, whose milk was sold as "special" milk at a higher price. It was pointed

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* The following authorities may be referred to on this point:—

"The few results which have been brought forward in relation to *milk production* are admittedly quite insufficient adequately to illustrate the influence of variation in the quantity and composition of the food on the quantity and composition of the milk yielded. Indeed, owing to the intrinsic difficulties of experimenting on such a subject, involving, as has been pointed out, so many elements of variation besides those which it is sought to investigate, any results obtained have to be interpreted with much care and reservation. Nevertheless, exercising such care and reservation in regard to the numerous results of ourselves and others which are at command, it may be taken as clearly indicated that, within certain limits, high feeding, and especially high nitrogenous feeding, does increase both the yield and richness of the milk." *Lawes and Gilbert* on "The Feeding of Animals for the Production of Meat, Milk and Manure, and for the Exercise of Force." "Journal of R.A.S.E.," vol. VI., 3rd series, 1895.

"The dairy farmer need no longer feel the necessity for supplying his cows at all costs with a highly nitrogenous diet; a liberal ration of cereal corn, including bran, is apparently sufficient to yield a full supply of milk and butter. There remain, however, many questions of practical economy to be settled, and the directors of local agricultural experiments cannot do better than study the effects of various diets on the production of milk and butter." *Warington* on "The Source of Milk Fat." "Journal of R.A.S.E.," vol. IX., 3rd series, 1898.

out by more than one witness that a simple and effective method of raising the average quality of milk produced by a herd of cows was the introduction of one or more Channel Islands cows, and this means is commonly resorted to when difficulty is found in otherwise supplying milk up to a contract standard. The great volume of the milk sold in England is produced by non-pedigree Shorthorns. One or two witnesses referred to the influence of Dutch cattle which were introduced into a number of milking herds in this country some years ago, and the offspring of which still survive in certain districts, notably in Essex.

Dyer, 338, 440.
Beecroft, 899.

33. In Scotland the predominant milk-producing breed of cattle is the Ayrshire. The Medical Officer of Health of Glasgow stated that from 80 to 90 per cent. of the milk supplied to that city was produced by Ayrshire cows. Mr. Drysdale said that he had tried different breeds and different crosses, but ultimately "drifted solely into the Ayrshire cow" as best suited to the climate and district. Considerable discussion took place as to the merits of the Ayrshire breed for milk-production, especially as regards quality. At an early stage of the inquiry two witnesses from Glasgow suggested that cows of this breed gave milk of relatively low quality as compared with other breeds, and intimated that where the milk supply was dependent upon Ayrshire cows it would not be fair to require so high a standard of quality as might reasonably be demanded in more favoured districts supplied by other breeds. This aspersion on the fame of the Ayrshires was, however, resented by other Scottish witnesses. Mr. Speir, on being asked if any such figure as 2·75 per cent. of fat would adequately represent even the morning milk of Ayrshire cows, replied, "If I go back to Ayrshire and tell them that such has been stated here, somebody will have to look out." Mr. Ralston stated that Ayrshire cows give a very fair quality milk; "they give it up to 3·4 quite easily," and Mr. Primrose McConnell stated that Ayrshires give "a medium quality milk—not so good as a Jersey, but better than a Shorthorn."

Chalmers, 3378.
Drysdale, 4307.
Stirling, 1811–2, 1958–9.
Kennedy, 1998–2002.
Speir, 2803.
Ralston, 5660.
McConnell, 3097.

34. Mr. H. Droop Richmond laid before the Committee the results of the analyses of the milk of 6,462 individual cows of different breeds. The number of each class of cattle thus represented varied from 18 Welsh cows to 2,849 dairy Shorthorns, so that the data are of unequal value, though for comparative purposes they are of considerable interest.

Appendix, XXIV.

No.	Breed.	Fat.	Solids not Fat.	Total Solids.
		Per cent.	Per cent.	Per cent.
88	Montgomery - - - -	3·59	9·02	12·61
1,292	Pedigree Shorthorn - - -	4·03	8·83	12·86
2,849	Dairy Shorthorn - - -	4·03	8·87	12·90
186	Red Poll - - - - -	4·34	8·88	13·22
1,493	Kerry - - - - -	4·72	8·98	13·70
132	Sussex - - - - -	4·87	9·31	14·18
18	Welsh - - - - -	4·91	9·24	14·15
404	Jersey - - - - -	5·66	9·23	14·89

The following figures are compiled from a table handed in by Mr. Lewin, of the Government Laboratory, in which the results of the analyses of the milk of 273 single cows of different breeds were shown:—

Appendix XXVII., B.

No.	Breed.	Fat.	Solids not Fat.	Total Solids.
		Per cent.	Per cent.	Per cent.
6	North Devon - - - -	3·43	9·68	13·11
13	Dutch - - - - -	3·75	8·65	12·40
207	Shorthorn - - - -	3·93	8·85	12·78
15	Ayrshire - - - - -	4·24	9·22	13·46
2	Welsh - - - - -	4·40	9·15	13·55
4	Kerry - - - - -	4·70	8·98	13·68
4	Guernsey - - - - -	5·16	9·30	14·46
6	Jersey - - - - -	5·43	9·22	14·65

Appendix XV. B.

A table handed in by Mr. Lloyd gives the following figures based on a number of analyses of milk from cows of different breeds:—

No.	Breed.	Fat.	Solids not Fat.	Total Solids.
		Per cent.	Per cent.	Per cent.
38	Red Poll - - - - - -	3·63	9·00	12·63
132	Shorthorn - - - - - -	3·91	9·02	12·93
48	Kerries and Dexter - - -	4·06	8·93	12·99
24	Ayrshire - - - - - -	4·13	9·15	13·28
49	Guernsey - - - - - -	4·77	9·12	13·89
158	Jersey - - - - - -	5·31	9·33	14·64

It was not claimed that the data on which these figures were based—being a small number of samples taken at the London Dairy Show—were sufficient to represent absolutely the average composition of milk from each breed, but they were put forward as an approximate indication of relative capabilities.

35. It is hardly necessary to observe that the number of pure-bred cows actually contributing to the milk supply is comparatively small, the great majority of the herds kept by farmers engaged in that industry being cross-bred. This would naturally tend to level such differences as are shown in the above figures, which, in any case, serve to indicate that limits which would be applicable to the milk of Shorthorns and Ayrshires would not be likely to press unduly on that of other breeds.

CONDITION OF COWS.

See Paragraph 55.

Lloyd, 5987–6006.
Thwaite, 6799.
Richmond, 8505.

Pocock, 1257.

Adams, 7910.

PERIOD OF LACTATION.

Lloyd, 5979.

Speir, 2874.

36. That cows devoted to the purpose of milk production must be kept in a healthy thriving condition is self-evident. The interest of the farmer should suffice to secure this, but in any case where from neglect or ignorance this may fail, it is admitted that the interests of the consumer ought not to be allowed to suffer by reason of the mismanagement of the producer. But it was urged by some witnesses that cows may get into low condition, and the quality of the milk be lowered, by more or less accidental and uncontrollable causes. The chief of these is the effect of the season or time of year, which, however, is so far a regular and persistent factor that it scarcely falls under this category, and may more conveniently be considered at a later stage. Unusual meteorological conditions—as, for instance, a prolonged drought or excessive rainfall—were referred to as unavoidably affecting the condition of cows and the quality of the milk. A period of drought, however, tends apparently—while no doubt diminishing the yield—to raise the percentage of fat in milk, although it is stated that at the same time the solids not fat decrease. A period of excessive rainfall would probably have the effect of impoverishing milk, and two witnesses referred to the disastrous year 1879 as an instance of this. No doubt variations in quality arising from exceptional causes of this kind may occur, and may not be preventable, but it is obvious that circumstances such as these, affecting all farmers alike, could, and doubtless in the ordinary course would, be taken into account by those who are charged with the administration of the Food and Drugs Acts. Another disturbing element which was referred to by some witnesses is the progressive change in the quality of the milk which naturally occurs during the period of lactation. Immediately after calving the cow gives for a short time a fluid—termed "colostrum"—which is abnormally rich in fat, but is not, from the commercial point of view, milk at all. When this ceases and the normal flow of milk commences, the quantity is at its maximum, and the quality—measured at any rate by percentage of milk-fat—after the first week or two falls to its minimum. Mr. Speir described the result of his experiments in 1893 and 1894 as regards the influence of the period of lactation: "Every newly-calved cow gave the richest milk the first week after she calved; about the second, or third, or fourth week she dropped down pretty quick to what you might call her normal point, and from that she gradually moved up until nearly the drying period; the week before getting dry it then would drop away at triple speed again." But a factor which is so far constant can scarcely be considered as involving insuperable difficulty. No doubt it

constitutes a practical difficulty in the management of a herd, and necessitates arbitrary arrangements, which are not always easily carried out, to ensure that the balance, so to speak, of "newly-calved" and "stale" cows in the herd is maintained as nearly as possible throughout the year. But it is an essential element in the business of a cow-owner, and while it might reasonably affect the applicability of fixed limits to the milk of a single cow, it must be assumed to be duly allowed for in the management of a herd.

INTERVAL BETWEEN TIMES OF MILKING.

37. Perhaps the most serious variation in the quality of milk as regards fat is that which arises from the difference in the interval of time which elapses between one milking and another. That the milk yielded by the cow in the morning is almost invariably less rich in milk-fat than that yielded in the afternoon or evening is a fact referred to by very many witnesses. Some of them brought forward analyses showing a considerable discrepancy on the same day, but at different milkings, but these were avowedly exceptional instances, and the general range of difference in the results put before the Committee may be reckoned at not more than 0·5 per cent. The valuable series of analyses handed in by Mr. Farmer, a member of the Committee, of milk produced by his own herds, show that generally the evening milk was the richer, by about 0·4 per cent of fat. It is impossible to estimate the average difference with precision, even if there were, as there are not, sufficient data for the purpose, inasmuch as it largely, or as some witnesses maintained entirely, depends upon the length of the interval between the milkings.

Marshall, 2189–94.
Middleton, 2281.
Curtis-Hayward, 4128–34.
Steel, 6263.
Ashcroft, 7486.
Dyer, 468.
Ashby, 1460, and App. VI.
Cameron, 2411.
Speir, 2959, 2973–4.
Walker, 7611.
Appendix XXXV.

38. Mr. Speir contended that there is "a very great misapprehension" on this point. He admitted that where the period of 24 hours is divided very unequally, as, for example, into 8 and 16 hour intervals, there will be great variation in the quality of the milk given. The longer the interval the more in quantity and the lower in quality, and *vice versâ*, may be accepted as an absolute rule. But Mr. Speir said: "If the day is equally divided into two equal periods, and no unnecessary disturbance is given to the cows during the day, my impression is that the difference between the evening and the morning is a matter of very small moment." This view was supported by Mr. Ralston and other witnesses, and, indeed, may be said to be generally endorsed.

Speir, 2788.
Ralston, 5725–8

39. Assuming the view to be correct that equal intervals of milking would give approximately uniform results, the difficulty remains that under the present conditions of milk supply it is for many farmers practically impossible to milk at equal intervals. Wherever it is possible they are, as a rule, well aware of its desirability. Mr. Primrose McConnell, representing the Central Association of Dairy Farmers, stated that 11 and 13 hour intervals were general, and that it was only "one case in a hundred" where 8 and 16 hour intervals were adopted. Mr. Walker said that 10 and 14 hour intervals were common in Yorkshire. Mr. Hoskins said that he milked at 5 a.m. and 4 p.m., but Mr. Pearce, also coming from the West of England, said his hours were 4.45 a.m. and 12.45 p.m., and he could not otherwise meet the requirements of his customers. Undoubtedly the distance from the market, the exigencies of the train service, and the requirements imposed by the trade are the controlling factors, in most instances, by which the hours of milking are mainly fixed. Beyond these considerations there is also another which appears to be assuming increased importance, viz., the supply of competent milkers willing to attend at any required hour. More than one witness pointed out, that even if other circumstances permitted him to milk at 12-hour intervals, he would have difficulty in inducing milkers to comply with his requirements. Thus Colonel Curtis-Hayward said: "In the present condition of the labour market you could not milk earlier in the morning as the men would not come. It is very difficult to get your cows milked at all, particularly on Sundays. You are obliged to suit, to a certain extent, your customers, and also you have to regulate yourself as to your labourers; you are very much in their hands." In Scotland, where the milking is done as a rule by women, this difficulty does not arise in the same way.

McConnell, 3067.
Walker, 7611.
Hoskins, 5289.
Pearce, 5098, 5177.
Curtis-Hayward, 4151.
Drysdale, 4337–41.
Pearce, 5205.
Steel, 6365–7.
Adams, 7998
Long, 8108.

40. While in regard to this and other practical difficulties the responsibility must rest upon the farmer to adopt all reasonable care and precaution in the management of his business, it is not to be expected that in all cases the discrepancy between morning and evening milk can be entirely avoided, or that the milk produced from a herd, however well it may be kept and managed, will always be absolutely uniform. This fact, accordingly, constitutes one of the elements to be borne in mind in considering the limits to be adopted.

Milk "Standards" in other Countries.

FOREIGN PRACTICE. Appendix XXXIV., XXXVII.

41. The Committee obtained, by the courtesy of the Secretary of State for Foreign Affairs, the latest available information respecting the standards for milk, condensed milk, and cream, which are authorised by law, or officially recognised for administrative purposes, in Belgium, Denmark, France, Holland and Germany. Information respecting the United States of America was also received from the Board of Agriculture.

Belgium. Appendix XXXIV., B.

42. In Belgium, a "standard" by which samples of milk are judged was drawn up in 1895 by the analysts attached to the State Agricultural Laboratories, who met in convention for that purpose. They agreed that a "normal milk, full and pure" shows a composition comprised within the following limits :—

———	Minima.	Averages.	Maxima.
Solids, grammes per 100 c.c. - - - -	11·50	13·00	15·00
Butter ,, ,, - - - - -	2·80	3·50	4·50
Lactose ,, ,, - - - - -	4·50	5·00	5·50
Casein ,, ,, - - - - -	3·00	3·80	5·00
Ash ,, ,, - - - - -	0·60	0·70	0·80
Non-fatty solids, 8·70 at least.			

The density varies from 1·028 or 1·029 to 1·033 or 1·034.

It is added that in certain districts of the country, milk will persistently show higher quality than above indicated, and "the same applies to mixed milk from a large number of cows." On the other hand, all the minima contents in butter, lactose, casein and ash, could not collectively occur in any one normal milk. Apart from "abnormal milk," it is laid down that milk, the contents of which are inferior to the above minima, has had cream extracted, been watered, or both had cream extracted and been watered, or at the least is doubtful and suspected of having been subjected to one or other of these manipulations.

Denmark. Appendix XXXIV., D.

43. In Denmark it is reported that a Sanitary Committee is now sitting to report on the "standard" for milk in Copenhagen. At present, however, the limit adopted in Copenhagen and some other towns is that of 2·5 per cent. of fat, but if milk found on analysis to fall below this limit can be proved to have come direct from the cow and to be unadulterated the vendor is not punished. A summary of the results of examinations of fresh milk carried out at the Laboratory of the Sanitary Commission during the years 1888-95 shows a progressive improvement in quality, the average percentage of fat having risen from 2·12 to 3·36.

France. Appendix XXXIV., E.

44. In France no special law exists with regard to the sale of milk, nor is there any legal "standard" beyond the regulations fixed by the Prefect of Police in Paris for the Department of the Seine, and by the Mayors of the different communes in the provinces. In a Report of the Hygiene Committee

on the composition of milk in Paris it is stated as "sufficiently established that cows' milk is composed on the average and in round numbers of

Water.	Total Solids.	Casein and Salts.	Milk-fat.	Lactose.
Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
87	13·00	4·00	4·00	5·00
And that the minimum limits may be fixed at				
88·50	11·50	4·00	2·70 to 3·00	4·58

It is observed, however, that the minima are represented by "a few rare examples," while the greater number "approximate closely to the average composition." The Committee further express the opinion that the minimum limits "cannot be considered as an absolute limit, proper to fix the point at which fraud commences," and that "milk can only approach the minimum limits under special circumstances, and when it is furnished by single cows, and that in consequence these limits cannot be invoked in favour of wholesale milk dealers, who deliver mixed milk solely in the trade, drawn from several cows."

45. In the Netherlands, although, as stated in the Foreign Office despatch, no judicial standard of quality in milk exists, a system of regulated milk control appears to have been started in Rotterdam in 1893 based on the assumption that milk was "abnormal" which contained less than 2·5 per cent. of fat and less than 11 per cent. of total solids. In 1895, the plan was adopted of having a number of samples taken every week from cows milked under official supervision, and treating the samples so obtained as "control" milk, representing presumably the standard to which "market milk" was expected to attain. Samples of "market milk" are, however, now only taken "from those retailers who are known to deal in milk of inferior quality," and do not consequently reach the level of the control samples. Thus the "control milk" had a mean percentage of fat of 3·65, while the "market milk" as represented by these samples during the same period averaged 3·15 per cent. of fat.

Holland.
Appendix XXXIV., C., XXXVI.

46. In Germany it appears that there is no Imperial Milk Law, but regulations exist in the separate States of the Empire on the subject of the treatment of milk. In Prussia stringent regulations are laid down for the control of the milk supply, under a Circular Decree of 27th May 1899. By these "whole milk" is defined as "milk that after milking has been in no way skimmed or otherwise altered, which has a specific weight of at least 1·028, and contains at least 2·7 per cent. of fat."

Germany.
Appendix XXXIV., G.

47. In the United States of America it appears that 21 States and Territories adopt a legal standard for milk. Of these 16 define a limit for total solids which reaches or exceeds 12 per cent.—except in Ohio, during May and June, when the limit of total solids is reduced to 11·5 per cent. The limit of fat ranges between 3 and 3·7 per cent., except in Rhode Island, where it is 2·5 per cent. with 12 per cent. total solids. In three States the limit is 3·5 per cent. of fat.

United States.

Chalmers, 3468–71.
Long, 8093.
Maskelyne, 9973.
Appendix XXXVII.

48. The Committee, while noting briefly some attempts made in other countries to solve the problem submitted to them, realise that in the absence of an exhaustive examination of all the facts, it cannot be assumed that the conditions affecting it are similar. They are bound therefore to have regard, in any conclusions at which they arrive, to the data laid before them relating to this country exclusively.

The Statutory Limits of Quality.

49. Having therefore accepted the necessity of fixed limits of quality as proved, and having reviewed some of the difficulties which have been raised in evidence, the crucial question of what the limits should be may now be considered. Various suggestions were made by witnesses with the object of so modifying such limits as to meet some of the difficulties which have been raised. These suggestions resolve themselves substantially into three, viz. :—

(1.) Limits varying in different districts.
(2.) Limits adapted for milk of different qualities.
(3.) Limits varying according to the time of year.

LOCAL LIMITS.

Stirling, 1958.
Drinkwater, 9206.
Dyer, 372.

See Paragraph 33.

50. The idea of having variable limits adapted to the assumed differences in the milk produced in particular districts was mooted by Mr. Stirling, who suggested that it would be unfair to fix the same limits for a locality where Ayrshire cows predominated, as for a locality where other herds prevailed, and appeared rather to favour limits for Scotland differing from and on the whole lower than those for England. Dr. Dyer also mentioned the possibility of making different limits for town and country. The claim for exceptional treatment for Ayrshire cows has previously been referred to, and, in the opinion of the Committee, negatived by the evidence. No doubt there is something to be said, on abstract grounds, for the principle of endeavouring to adjust the limits of quality of milk to the precise possibilities of the land, class of cattle, and other circumstances of each district, and if all milk went into consumption—as it still does to some extent in rural districts and small towns, and as it once did everywhere—in the immediate vicinity of the place of production, such a system might conceivably be practicable. But under the present conditions of the milk trade a system of local limits would be impracticable. Obviously in the great centres of population it would be impossible to discriminate between milk coming from different localities, and if each large town had its own limits applicable to milk from all quarters the principle of local adaptation would be lost.

To establish a system under which milk of the same quality should be assumed to be genuine on one side of a boundary line, and adulterated on the other side, would not conduce to the effective administration of the law.

GRADING MILK.

Maskelyne,
9972–86,
10036–9, 10160.

51. There is more to be said in favour of the suggestion that milk should be, so to speak, classified or graded according to quality. Mr. Story Maskelyne, who had publicly advocated the adoption of this principle at the time of the passing of the Food and Drugs Act, 1899, explained his views on the subject to the Committee. He recommended that in addition to ordinary milk for which limits should be fixed, there should also be recognised a superior grade of "prime" milk containing by regulation a higher percentage of fat. The standard for the latter he would regard as a sort of "honorary trade mark." He suggested 3·25 per cent. as the limit for ordinary milk and 3·5 per cent. as that for "prime" milk.

Walker, 7569–95.
King, 5398.
Ralston, 5754.
Smith, 7012.
Ashcroft, 7520.
Long, 8137.

52. Somewhat similar suggestions were made by other witnesses. Mr. Walker, for instance, proposed that there should be three recognised grades of milk, the fat percentage of which should be 2·4, 3·4 and 4·4 respectively. Under this plan milk would be offered for sale as first, second or third grade, and to describe it falsely would be a punishable offence. To this particular proposal an objection was at once raised that the limit fixed for the lowest grade would legalise the sale of a large quantity of milk of very poor quality, much of which might be adulterated, but the witness did not lay so much stress upon the actual figures mentioned as upon the principle involved in his suggestion.

53. The theoretical advantages of a system under which the price of milk to the public should be regulated by its real value—which is, broadly speaking, its richness in fat—are self-evident. It would provide the most direct incentive to farmers to produce the highest quality of milk;

it would secure to the consumer the delivery of an article of the nature and quality demanded, and it would to a great extent remove some of the chief difficulties which attend the fixing of statutory limits. But the Committee have to admit that however desirable such a system may be in theory, they are not convinced of its practicability. Several witnesses who assented to its desirability expressed the view that it is at present impossible to adopt it. All who have experience of the milk trade concur in the statement that the public as yet will not buy milk on this basis. Attempts have been and are being made to offer milk of a superior quality, or prepared in a particular way, to the public at a higher price, but the demand is very limited, and so far as it exists it is a demand for purity, *i.e.*, freedom from adulteration or contamination, rather than for extra richness. It must be admitted that there is no evidence to show that the public at large would show a preference for the higher grades of milk at commensurate prices. In fact, if the lowest grade were—as it necessarily must be—up to a particular official limit, and so in a sense guaranteed as genuine, there is reason to fear that the overwhelming bulk of the milk supply would continue to be sold at that quality and price. If this were so the result would inevitably be the "toning down" of richer milks to the lowest standard quality, and indeed the virtual recognition of that practice as legitimate.

54. It may be observed, however, that the custom of buying milk from the producer on a quality basis is already the common practice at factories where butter is made, and it is also very generally adopted in principle by other milk dealers, who as a rule buy by contracts which name a minimum limit of fat, varying, according to the evidence, from 3·25 to 3·8 per cent., while in some cases both factories and milk dealers pay a higher price for milk of more than average quality.

Carrick, 1002.
King, 5389.
Ralston, 5655.
Richmond, 8367–8, 8585.

SEASONAL LIMITS.

55. A considerable amount of evidence was brought forward to show that the average quality of milk is usually lower during the spring and early summer, *i.e.*, especially during the months of April, May, and June, than at other times of the year. This may be indicated succinctly from the tables of analyses handed in by Mr. Richmond, as summarised in conjunction with the results of similar tables laid before the Select Committee of the House of Commons on Food Products Adulteration in 1894. The analyses of the milk supplied to the Aylesbury Dairy Company show that on the average of 10 years the percentage of fat is lowest in May and June, the months coming next being April and July. The series of analyses handed in by Mr. Farmer give a similar indication, and indeed the fact is commonly recognised by milk producers and dealers. It is, however, to be noted that whilst there may be occasional instances of milk containing less than 3·25 per cent. of fat during these months, it is comparatively seldom that the total solids of the milk fall below 12 per cent. at this period.

Appendix XXIV., XXXV., 3.

Appendix XXXV.

56. The following tables show the minimal and average percentages of fat in morning and evening milk respectively from each of Mr. Farmer's eight farms as recorded in the months of April, May and June in 1899 and 1900. It appears from these figures that on no occasion did the average percentage of fat in the evening milk fall lower than 3·55, while the average percentage of morning milk fell in May 1900 as low as 3·11 at one farm and at three other farms in the same month to 3·21, 3·22 and 3·25. In June 1899 the average fell at one farm to 3·19 and in June 1900 at two farms to 3·16 and 3·17 respectively. In the records of minima relatively similar results are shown. At five of the eight farms the evening milk never fell below 3·25 per cent. of fat and in only two months, April and May 1899, did it do so at the three other farms. The morning milk on the other hand showed minimal records falling below 3·25 per cent. of fat at one farm in April, at six farms in May and at the whole eight in June 1899, while in the following year the minima fell below 3·25 at every farm during the three months except at one farm in April.

MINIMA.

Farm.	MORNING.						EVENING.					
	1899.			1900.			1899.			1900.		
	April.	May.	June.	April.	May.	June.	April.	May.	June.	April.	May.	June.
Number 1 -	3·35	2·85	2·90	3·20	3·05	3·20	3·75	3·50	3·55	3·55	3·25	3·55
„ 2 -	3·45	3·30	2·85	3·15	3·05	3·10	2·75	2·45	3·25	3·40	3·30	3·60
„ 3 -	3·55	3·15	3·05	3·30	3·10	3·20	2·85	2·95	3·65	3·60	3·65	3·30
„ 4 -	3·35	3·25	3·15	3·05	3·20	3·05	3·35	3·55	3·45	3·25	3·45	3·60
„ 5 -	3·05	3·15	2·95	2·90	2·95	2·85	3·45	3·45	3·55	3·35	3·45	3·30
„ 6 -	3·35	2·95	3·05	3·15	2·95	3·20	3·90	3·55	3·35	3·50	3·55	3·70
„ 7 -	3·45	2·80	2·75	3·15	2·95	2·85	3·75	3·50	3·40	3·60	3·50	3·40
„ 8 -	3·35	2·85	2·85	3·15	2·45	3·00	3·10	2·85	3·25	3·50	3·00	3·15

AVERAGES.

Number 1 -	3·83	3·43	3·32	3·33	3·29	3·38	4·22	3·86	3·84	3·73	3·72	3·84
„ 2 -	3·69	3·56	3·36	3·40	3·25	3·32	3·69	3·88	3·72	3·77	3·70	3·87
„ 3 -	3·87	3·81	3·72	3·57	3·44	3·45	4·17	4·20	4·07	3·85	4·03	3·78
„ 4 -	3·65	3·52	3·38	3·30	3·33	3·37	3·95	4·15	3·80	3·69	3·81	3·83
„ 5 -	3·51	3·52	3·34	3·15	3·21	3·16	3·93	3·79	3·89	3·59	3·67	3·77
„ 6 -	3·58	3·37	3·27	3·41	3·29	3·45	4·14	3·86	3·67	4·13	3·98	3·88
„ 7 -	3·71	3·39	3·19	3·30	3·22	3·17	4·07	3·82	3·75	3·80	3·83	3·66
„ 8 -	3·59	3·29	3·35	3·45	3·11	3·28	3·83	3·59	3·57	3·76	3·56	3·55

It should be observed that Mr. Farmer informed the Committee that the large majority of the cows were in an advanced stage of lactation during the months referred to in the above tables.

57. It is hardly necessary to observe that admitting the existence of a regular season of comparatively poor milk it does not necessarily follow that no steps can be taken to meet the difficulty. It is possible in most instances by the skilful management of cows to obtain a fairly uniform quality of milk all the year round. It is probable, indeed, that some progress has been made within recent years in the direction of greater regularity and uniformity of supply. The relative poverty of milk in spring is due mainly to two causes, viz., the number of freshly-calved cows coming, in the ordinary course, into milk at that time, and the stimulating effect of the first flush of grass exciting an increased flow and a consequent lowering of quality. The skilful farmer whenever practicable tries to counteract these influences, on the one hand by arranging for his cows to calve at different times of the year, especially in the winter, and on the other hand by supplementing the pasturage by an allowance of concentrated Adams, 7956, 8009. food. But, as practical witnesses intimated, the idiosyncracies of certain cows may have to be reckoned with. It is, for instance, not always possible to secure that every cow should calve down at the time most convenient to its owner, or benefit by the concentrated food when provided. No doubt if cows are kept under entirely artificial conditions, as, for instance, in urban Drinkwater, 9172. cowhouses, they are more amenable, and the Committee were informed that in the Edinburgh cowsheds the richest milk is given in the summer.

58. Whilst it is no doubt true that the average quality of milk is usually lower, for the reasons stated, in the later spring or early summer, it is no less true that the average quality is uniformly higher in the autumn and

winter months. Indeed, the analytical figures put before the Committee show that there are far more instances of milk containing 3·5 per cent. and upwards of fat at these seasons than of milk sinking so low as 3 per cent. in the spring months.

59. But in view of the facts it was not surprising that some witnesses should suggest the establishment of limits which should vary at different times during the year. Thus Mr. Hoskins, a Somerset farmer, favoured a standard of 2·75 per cent. fat for April, May, and June, and for the remainder of the year, 3 per cent. Mr. Hoddinott, while objecting to the principle of fixed limits, made a similar suggestion, though he added another month (March) for the lower figure. Mr. Adams made the same division of the year, but desired to fix 3 per cent. for the four lower months, and 3·25 for the rest of the year. Dr. Chalmers suggested the same figures, but confined the 3·25 standard to the months of November, December, and January. Professor Long said that if a higher standard than that which he advocated —viz., 12 per cent. total solids, including not less than 3 per cent. fat—were adopted, he would suggest the exception of April, May, and June. Mr. Richmond proposed a somewhat elaborate sliding scale as follows:—January to April, 3 per cent. fat; May and June, 2·8 per cent.; July and August, 3 per cent.; September to December, 3·25 per cent. He added, however, that if this were considered too complicated he would abandon the May and June standard. This was emphasized in a letter from the Aylesbury Dairy Company (on whose behalf Mr. Richmond gave evidence) in which they said: "Though we think that the standard might be lowered during May and June, we are far more anxious to see it raised during the autumn and winter, and if it were a question of abandoning the raising in the winter, or the lowering in May and June, we should unhesitatingly abandon the latter."

Hoskins, 5340.
Hoddinott, 7704–10.
Adams, 7912.
Chalmers, 3467.
Long, 8095.
Richmond, 8355, 8606.
Appendix XXXV.

60. Some witnesses of wide experience in the administration of the Food and Drugs Acts considered any attempt to set up seasonal limits to be absolutely impracticable, Dr. Bernard Dyer and Mr. A. H. Allen, for instance, taking this view unhesitatingly. The President of the Society of Public Analysts said his society made no recommendation on the point, and while he would be disposed to assent to variable limits if practicable, he doubted the practicability of administering such a system.

Dyer, 390.
Allen, 4577–82.
Fisher, 3802, 4104.

61. It seems evident, on careful consideration, that an attempt to vary the limits at different times of the year would lead to anomalies quite as great as any which it would avoid. Putting aside the variation in the quality of milk occasioned by an undue proportion of cows coming into full profit—which, however beset with difficulties, is a question of cattle management to be left to the skill and resourcefulness of farmers—the only reason which can be accepted as having serious weight is that which arises from the first turning out of the cows into the pastures when the grass commences to grow in the spring. But this is far from being a fixed date. It is in the first place a question of latitude, the difference between the South and South-West of England and the North of Scotland representing probably as much as a month or six weeks in the growth of vegetation. Or, again, in the climate of this country, the difference between one year and another is often very considerable, and a "late spring" or an "early spring" may postpone or accelerate the growth of the pastures to the extent of several weeks. The tables put in by Mr. Richmond, giving the highest and lowest percentages of fat in milk sent out by the Aylesbury Dairy Company on each day for six years, show that the actual minima did not always occur in the same month. Thus in 1894 the minimum occurred in February and May, in 1895 in June and September, in 1896 in May, in 1897 in August, in 1898 and 1899 in May and June. By a calculation which he explained to the Committee, Mr. Richmond made what he termed an "actuarial valuation of the results" to arrive at the true average percentage of fat and solids not fat in each month of the six years, and this undoubtedly tended to indicate that the lowest percentage of fat occurred usually in May and June, although in 1895 it occurred in July, and in 1894 the average for March was only 0·04 above the average for May. A table handed in by Dr. Hill, giving the

Appendix XXIV.
Appendix II.

average composition of milk purchased under the Sale of Food and Drugs Acts in Birmingham in each quarter of the years 1894–99, showed that the lowest average percentage of fat occurred in 1894 and 1895 in the third quarter, in 1896 and 1897 in the first and second quarter alike, in 1898 in the first quarter, and only in one year, 1899, in the second quarter. A table handed in by Mr. Ralston showed the average monthly analyses of all milk received at the Dunragit Creamery from March 1892 to February 1900. From this table it appeared that the lowest monthly average was recorded in March for three years, in May for two years, and in June for two years.

Appendix XIII.

62. While therefore it is no doubt generally true, as already stated, that milk is on the average somewhat lower in quality during May and June—although the evidence seems to show that the difference is not very great as compared with some other months—it is also apparent that the period of lowest quality may vary in particular years. But if a concession were made for certain months, and it happened that from peculiarities of the season the quality of milk was generally higher in one or other of those months than in some other months when higher figures might be insisted upon, the administration of justice would be impeded, and dissatisfaction would naturally be aroused.

63. The Committee, therefore, are of opinion that the setting up of two distinct sets of statutory limits, one of which is to be applicable only to a particular and relatively short period of the year, would be attended by grave administrative difficulties. This consideration, in their judgment, outweighs the reasons which have been urged in favour of the principle of seasonal limits, as they believe that the minor difficulties associated with the occurrence of small seasonal changes in the quality of milk can be met, partly by the joint efforts of the producers and vendors themselves, and partly by the mode in which the limits may be defined, as well as by the manner in which they are applied by those responsible for the effective administration of the Acts.

64. The adoption of a set of minimal limits which should be applicable at all times and under all conditions to milk produced for consumption as such is therefore the course which commends itself to the Committee.

SUGGESTIONS OF WITNESSES AS TO LIMITS.

65. The Committee cannot overlook the fact that a merely numerical summary of the suggestions made by witnesses as to the actual figures to be adopted as statutory limits, would represent very inadequately the effect which the evidence on this point produced upon their minds. It is obvious that many of the witnesses, while affording valuable assistance to the Committee on important matters affecting the general subject could not, in the nature of things, speak from personal knowledge of the exact significance of analytical data, or the precise effect of particular analytical limits. Several witnesses indeed disclaimed any intention of speaking except in general terms on this point. It is necessary therefore to examine the evidence somewhat closely in order to give due weight to that which is founded on personal knowledge and experience of the composition, scientifically speaking, of milk.

66. In examining the specific suggestions made as to the limits which may be set up by regulation it must be remembered that evidence before the Committee was mainly of three classes: evidence respecting the bearing of minimal limits on the conditions of milk production, from farmers and agricultural associations; evidence respecting the conditions of the milk trade, from milk-trading companies and distributors; and evidence bearing on the analytical facts and questions on which the solution of the problem under investigation must necessarily rest, from analytical experts.

FARMERS.

Finney, 3188, 3195.

67. The witnesses on behalf of milk-producers, where they did not, as in the case, for example, of Mr. Finney, decline the responsibility of suggesting limits "because they were farmers and not analysts," confined themselves, for the most part, to the question of fat percentage, this being, in their minds,

the determining factor of the commercial value of milk. In certain cases they had made examinations of milk for themselves by one of the mechanical testers now commonly used, but in many instances the figures which they quoted were those which had been furnished to them by the dealers to whom they sold their milk. It is of interest to note that those who had made independent investigation were almost invariably in favour of fixing the statutory limits at a higher point than were those who had given less personal attention to the subject. Of the agricultural societies whose representatives suggested limits, the Central Chamber of Agriculture had by resolution of their Council recommended a "standard" of 12 per cent. total solids, whereof not less than 3 per cent. should be fat. The Highland and Agricultural Society of Scotland and the Scottish Chamber of Agriculture confined their recommendations to a suggestion that the limits of fat should not be less than 3 per cent. The Central Association of Dairy Farmers and three other societies favoured limits of 3 per cent. of fat and 8·5 per cent. solids not fat, one of the societies making an alternative suggestion of 12 per cent. total solids. A Gloucestershire society named 3 per cent. of fat alone, while four societies preferred limits ranging from 2·75 to 2·8 per cent. of fat, with 8·5 per cent. solids not fat in two cases.

Middleton, 2276.
Speir, 2700.
Drysdale, 4466.
McConnell, 3057.
Ralston, 5652.
Steel, 6289.
Pearce, 5079.
Beecroft, 820.
Marshall, 2265.
Hoskins, 5235.
Smith, 7060.

68. The Committee have to note that some of these witnesses expressed a personal preference for higher limits than those which, as representing their respective societies, they were bound to put forward.

Thus Mr. Speir, whose investigations on behalf of the Highland and Agricultural Society enable him to speak with a considerable degree of confidence, suggested that the limit of fat could be easily fixed at 3·2 or 3·25 per cent., provided arrangements were made for an "appeal to the cow," or for "putting some buffer, as it were, between the prosecuting agent and the court." He himself would feel no uneasiness if the limit were put higher than he suggested.

Speir, 2701.

Mr. Primrose McConnell, who spoke as a scientific man as well as a farmer, stated that the limits of 12 per cent. total solids, comprising 3·25 per cent., would not be unjust.

McConnell, 3077, 3124.

Mr. W. H. Ralston, who uses the Babcock tester on his farm, and has carried out a number of experiments on his cows, said: "I think 3·25 would be a fair thing in butter-fat; that is my own personal opinion, and I know it is the opinion of others than myself."

Ralston, 5716, 5767.

Mr. Alec Steel said: "Speaking personally, after investigating during the last six months over a thousand analysed samples of milk, with the analyst's report attached, I feel sure there would be no undue risk of punishment to producers if the minimum standard of quality was fixed at 3·20 fat and 8·80 solids not fat, making 12 per cent. of total solids, and that such a standard would simply turn out a blessing in disguise to both the milk-producing industry and the milk-consuming public."

Steel, 6272.

Professor Long, whose experience in matters relating to milk-production is very great, while suggesting 12 per cent. total solids, including not less than 3 per cent. of fat, as the limits, said that if he dismissed public opinion from his thoughts, and spoke absolutely from his own knowledge, he would suggest 3·25 per cent. as the limit for fat.

Long, 8178.

It is significant that the two farmers owning the largest herds of milking cows, who appeared before the Committee, Messrs. Stratton and Adams, and whose personal interest in the question may therefore fairly be said to be relatively the greatest, advocated 3·25 per cent. of fat as the limit, although with the reservation in one case that it should be reduced to 3 per cent. in the months of March, April, May, and June.

Stratton, 6496.
Adams, 7912.

TRADERS.

69. The evidence of witnesses representing the trade in milk—*i.e.* the intermediary agencies between the producer and consumer—was directed almost without exception to the advocacy of a *laissez-faire* policy, or of the adoption of statutory limits, such as 2·75 per cent. of fat, lower even than those which for some time past have been generally accepted by the public analysts and by the Government Laboratory. The Committee are unable to find any justification, in the general body of evidence, for an attempt to "put back the clock," so to speak, in this matter. They desire to give due

consideration to the commercial interests involved, but they cannot overlook the fact that the precise degree of quality which it is reasonable to expect in an article such as milk is not primarily a matter for the judgment of those through whose hands it merely passes on its way from the producer to the consumer. Undoubtedly the vendors of milk appear to the Committee to be fully impressed with the necessity of exercising a careful supervision over the quality of the commodity they supply. They have also a direct personal interest in the administration of the law as being subject in the first instance to its application, and therefore on such questions as the mode of collecting and retaining samples and other administrative procedure they have every right to be satisfied that they are properly safeguarded. As men of business they must, consciously or unconsciously, incline to the view that it is desirable to minimise the risk of interference in their business, and in any statutory limits that may be established, to secure as wide a margin as possible for contingencies.

See Paragraphs 8–10.
Carrick, 981.
Gates, 1177.
Stirling, 1897.
Kennedy, 1993.
Carruthers, 2666.
Bowler, 3315.
Prideaux, 7339.

70. Reference has already been made in preceding paragraphs of the Report to the fact that the representatives of two associations of milk vendors, and also two individual milk dealers, recommended that no limits should be fixed by regulation. Seven other witnesses who appeared on behalf of the trade recommended the fixing of limits as low as 2·75 or 3 per cent. of fat.

ANALYSTS.

71. As already indicated, it was mainly the third class of witnesses, viz., analysts, who were able to speak accurately, from personal knowledge, to the composition of milk. The Committee were fortunate in having the assistance of analysts whose authority in regard to this subject is of indisputable eminence and to whose opinion, therefore they are bound to give special attention in considering the precise statutory limits which may be adopted and the form in which they shall be expressed. Nor can it be overlooked that while the views of both producers and distributors may be affected by the fact that their personal interests are more or less involved, public analysts are in a position to draw conclusions from the facts with entire impartiality. While, in short, it might be said that a farmer or trader had a direct interest in the improvement of the general quality of milk, or in the stringency of measures to check its adulteration, it is difficult to conceive any reason why a public analyst should have a personal preference for any particular limits except, as a scientific man, in the interests of truth. The commercial value of the commodity has, of course, no relation to his functions, and the criteria adopted, whether based upon the amount of fat, of casein, of ash, or of any other constituent, are of interest to him only in so far as they facilitate the examination of the milk and afford indications of its relative composition.

Drinkwater, 9264, 9363.
Hill, 40.
Dyer, 346, 418.

72. With the exception of Dr. Drinkwater, who appeared before the Committee to represent the views of the Edinburgh and District Dairy-keepers' Association, all the analysts were disposed to recommend that the limit of fat should certainly not be less than 3 per cent., and many of them were of opinion that it ought to be more. Dr. Drinkwater explained that his Association had passed a resolution by a majority of two to one that the limit of fat should not be higher than 2·55 per cent., but that he had declined to appear in support of such a proposition, although he thought that a milk containing only 2·75 per cent. is "as good as should be sold." To some extent the views of the analysts as to the exact limit of fat depended upon the limit of total solids which might be adopted. Dr. Hill, for example, preferred that the limits should be stated in the form of total solids, with a limit for fat, and he stated that 12 per cent. of total solids, with a limit of 3·5 per cent. of fat, would be fair and reasonable. Dr. Dyer was of opinion that the so-called official limits of the Society of Public Analysts of 3 per cent. of fat, and 8·5 per cent. of non-fatty solids had worked well in practice, and had served to protect the public, he would not say against adulteration, but against excessive adulteration, for "there is no doubt that both limits are low, having regard to the average quality of milk." He added, "The limit of 3 per cent. for fat is low enough to tempt the producer or dealer to remove

fat, or, which is the same thing of course, to add separated milk." He thought that in nine cases out of ten a 3·5 per cent. limit would probably be much more fair to the consumer, and he further stated that a limit of 3 per cent. is obviously far too low if 12 per cent. of total solids be taken.

De Hailes, 599, 657, 675.

Mr. De Hailes, who acts as analyst to the Dairy Trade Protection Society, and who appeared to represent their views before the Committee, whilst objecting to any standard having the force of law, admitted that a limit of 8·5 per cent. non-fatty solids was too low; he would take 8·8 or 8·75 per cent., or something of the sort. He stated that he himself practically adopted a standard of 11·8 per cent. total solids, of which 3 per cent. should be fat. It appears, however, from a table of analysis handed in by Mr. Barham, that he reported milk containing as little as 3 per cent. of fat as very poor.

Appendix XXXII.

Ashby, 1471, 1436, 1448, 1473.

Dr. Ashby, Medical Officer of Health and Public Analyst in Reading, thought that the standard suggested by the Society of Public Analysts was fair and reasonable, although rather low. Indeed, he was of opinion that the percentage of fat might be raised even a little higher without unfairness, although he did not suggest it. In the large majority of cases—the very large majority of cases—it is far above 3 per cent. He thought that 3·25 per cent. of fat would almost always be reached throughout the country if farmers kept their cows under proper conditions, and kept proper cows.

Cameron, 2434.

Sir Charles Cameron, Medical Officer of Health and Public Analyst in Dublin, suggested a limit of 12 per cent. of total solids, which should include at least 3 per cent. of fat.

Fisher, 3749, 3796.

Mr. Fisher, who appeared to represent the Society of Public Analysts, explained that the Council were divided on the question of limits, at least as regards fat, some of the members being anxious to raise the so-called official standard from 3·0 to 3·2, or 3·25, or even 3·5 per cent. After a prolonged discussion, it was decided to adhere as a recommendation to the Committee to the limit which the Society advocated in 1886. He stated, however, that it cannot be disputed that this standard permits the addition of separated milk, and if he thought the practice was at all general, he would be perfectly willing to see the standard raised.

Bevan, 8927.

Mr. E. J. Bevan, honorary secretary of the Society of Public Analysts, stated that the resolution of Council referred to by the President was carried by a majority of one, and that he attended to represent the view of the minority that the limit of fat should be raised to 3·25 per cent. He was of opinion that the general body of members would be in favour of a higher limit than 3 per cent.

Cassal, 9015, 9072.

Major Cassal, a vice-president and formerly honorary secretary of the Society of Public Analysts, was also of opinion that the limit of fat should be raised to 3·25 per cent., although he was only authorised by the Kensington Vestry to suggest a limit of 3 per cent. on their behalf. He was pretty well satisfied that had this question been put before a representative meeting of the whole Society of Public Analysts, there would have been no difficulty in carrying a resolution—probably by a large majority—in favour of a limit of 3·25 per cent. of fat.

Allen, 4509, 4696.

Mr. Allen, of Sheffield, was of opinion that a 3 per cent. limit permits an enormous amount of skimming or abstraction of fat, and that it might be raised to 3·2 or 3·25 without causing any injustice to the vendor. If the amount of total solids were fixed at 12 per cent., he thought the limit of fat ought certainly to be raised to 3·25 per cent.

Macdougald, 4959.

Mr. Macdougald, of Dundee, who makes a speciality of milk analysis for the trade, recommended a limit of 3·25 per cent. of fat, and considered that it would be easily maintained throughout the country. He produced a contract for milk which stipulated for not less than 12 per cent. total solids of which not less than 3·5 must be butter-fat.

King, 5374.

Mr. Falconer King, of Edinburgh, thought that the limit of fat might quite well be raised to 3·25 per cent. He said that the abstraction of fat goes on largely in Edinburgh, and is the main form of adulteration. He added that the Edinburgh Milk Supply Association lays down a standard of 3·5 per cent of fat, and has no difficulty in getting any quantity of milk of that quality.

Lloyd, 6031.

Mr. F. J. Lloyd, who suggested a "standard" of 3 per cent. of fat and 12 per cent. total solids, with a "limit" of 2·7 per cent. of fat and 8·55 per cent. solids not fat, nevertheless thought it perfectly evident that a minimum, so far as total solids are concerned, would be 12 per cent., or even more, and that it is exceptional for the fat to fall below 3 per cent. when the solids amount to 12 per cent. He expressed the hope that the day will come when the standard of fat might be raised to 3·25 per cent., as he did not think it would be difficult for the farmers of England to comply with it.

Richmond, 8631.

Mr. Droop Richmond, who appeared to represent the Aylesbury Dairy Company, thought that a limit of 3 per cent. of fat is not too high, and that during the winter months, at least, it might be 3·25 per cent.

ANALYTICAL RESULTS.

73. A considerable number of the analytical results brought before the Committee were avowedly selected with the object of illustrating some particular point, as for instance the variation between morning and evening milk. Some of these results, while valuable in their way, do not form a guide to a correct estimation of the general character of milk. There remains, however, a large amount of information, throwing light on this point, to which it is necessary briefly to refer.

74. It is clear that analyses of milk drawn directly from the cow, without passing through any intermediate hands, are the only results which can be considered as representing the absolutely genuine product. So soon as the milk begins to be handled it is exposed to risks and vicissitudes. An illustration of this was given by a Somerset witness who discovered that (Hoskins, 5240.) the farm servant who took his milk to the railway station was in the habit of taking bread with him and making a meal from the cream on the top of the can. It is therefore well to remember that all analyses of milk taken after it has left the farm—or indeed after it has been actually seen to be milked—represent a commodity which may possibly have been, by accident or design, reduced in quality. Dr. Hill stated that taking the (Hill, 5. Appendix I.) mixed milks of whole dairies of cows milked in his presence, he had never known the total solids in the milk fall below 12·68 per cent. in any dairy. The analyses of milk from 111 single cows in the Birmingham district showed an average of 4·2 per cent. fat, 8·8 per cent. solids not fat, and 13 per cent. total solids. The Glasgow Dairymen's Association appointed a Committee in 1894, which visited certain farms and took samples from a (Stirling, 1774.) number of single cows milked in their presence, the analyses showing the average of 30 cows to be 3·49 per cent. fat, 9·30 solids not fat, and 12·82 per cent. total solids. Sir Charles Cameron gave the analyses of the com- (Cameron, 2415, Appendix IX.) position of the milk of 42 cows and 8 cows made at Glasnevin Model Farm in 1880 and 1899 respectively. The mixed milk from the 42 cows showed in the morning 4·2 per cent. of fat, 9·7 per cent. solids not fat, making 13·9 per cent. total solids, and in the evening 4·64 per cent. of fat, 9·82 per cent. solids not fat, making 14·46 per cent. total solids. The mean composition of the milk of the eight cows for six days was: morning, 2·9 per cent. of fat, 9·2 per cent. solids not fat, 12·1 per cent. total solids; evening, 4·88 per cent. of fat, 9 per cent. solids not fat, 13·88 per cent. total solids.

Lloyd, 5954, Appendix XV.

75. The analysis of milk supplied to cheese-making schools in Somerset during the months April to October in each of the years 1892 to 1897 showed an average of 3·65 per cent. of fat and 12·64 per cent. total solids, a different herd being represented each year. It appears that in no instance during the four years 1894–7 did the milk as shown by these results fail to show 12 per cent. total solids or 3·25 per cent. of fat. In the years 1892 and 1893 there were nine cases in which the milk showed less than 3·25 per cent. of fat, but in seven of these the total solids exceeded 12 per cent. In only two instances out of 42 were the results below both criteria. The (Appendix XXVII.) evidence furnished by the Government Laboratory included the analyses of samples of milk of 273 single cows and of 55 herds taken in 1893 under the supervision of an officer of that department. The average of the 273 (Lewin, 10555.) cows was 3·99 per cent. fat, 8·90 per cent. solids not fat, 12·89 per cent. total

solids. The 55 samples of mixed milk, which were collected from a wide area and included town daries as well as herds kept on farms, showed the following range on analysis :—

——	Fat.	Solids not Fat.	Total Solids.
Lowest - - -	2·89	8·79	11·68
Highest - - -	5·61	8·73	14·34

The mean of the 55 samples (representing, of course, herds of varying size) would be 4·0 fat, 8·96 solids not fat, 12·96 total solids. It may be noted that in three other cases besides the lowest the total solids fell very slightly below 12 per cent., but in one of these the fat was well above 3·25 and in the other two only fractionally lower.

76. The tables handed in by Mr. Farmer, giving the monthly average composition of milk yielded by his eight herds of cows showed in each case the following average results over a period of eighteen months, from January 1899 to June 1900, and thus comprising two periods of Spring :—

Appendix XXXV.

Farm.	Morning.			Evening.		
	Fat.	Solids not Fat.	Total Solids.	Fat.	Solids not Fat.	Total Solids.
No. 1 - - -	3·55	9·00	12·55	3·92	8·94	12·86
„ 2 - - -	3·55	9·01	12·56	3·86	9·04	12·90
„ 3 - - -	3·65	9·01	12·66	4·02	9·04	13·06
„ 4 - - -	3·49	8·95	12·44	3·89	9·02	12·91
„ 5 - - -	3·41	8·93	12·34	3·82	8·96	12·78
„ 6 - - -	3·51	9·03	12·54	4·02	9·07	13·09
„ 7 - - -	3·50	9·07	12·57	4·01	9·02	13·03
„ 8 - - -	3·53	8·90	12·43	3·83	8·90	12·73

Among analyses of milk on the farm which were produced in evidence, but which were confined to a determination of the percentage of fat, may be mentioned the average for Mr. Ralston's herd of 100 cows, which was 3·57, and the following figures representing the average fat percentage of milk from different groups of animals in Mr. Drysdale's herd :—Nine cows, 5·37 ; twenty-two cows, 4·69 ; fourteen cows, 4·21 ; twenty three cows, 3·55.

Ralston, 5675.
Drysdale, 4307.

77. The most extensive series of figures representing milk as received from farmers by a dealer were those submitted by the Aylesbury Dairy Co. These represent the results of 76,058 samples analysed during the years 1894–99, and show that of the whole number only 0·74 per cent. fell below 3 per cent. of fat, 3·5 per cent. below 3·2 per cent. of fat, and 6·9 per cent. below 3·3 per cent. of fat.

Richmond, Appendix XXIV.
Appendix XXV.

The average of 120,540 samples of milk analysed by Dr. Veith, for the Aylesbury Dairy Company, was 4·1 per cent. of fat, 8·8 per cent. solids not fat, 12·9 per cent. total solids.

Appendix I.

78. The average monthly analysis of all the milk received at the Dunragit Creamery from March 1892 to February 1900 showed an average for the whole period of 3·55 per cent. of fat. The morning milk supplied to Messrs. Tunks and Tisdall from several herds during the years 1887 to 1899 ranged on the average, from 3·23 per cent. fat and 9·11 per cent. solids not fat to 3·60 per cent. fat and 9·50 per cent. solids not fat. Mr. Cowan, a member of the Committee, handed in a table showing the analyses of milk delivered to the Galloway Creamery in November to December 1899, and January to April 1900, which showed an average monthly percentage of fat ranging from 3·44 to 3·79, and a further statement for the period May to October 1900, in which the monthly average ranged from 3·40 to 3·93 per cent.

Ralston, Appendix XIII.
Lloyd, Appendix XVIII.
Appendix XXXI.

Steel, 6270.

Mr. Alec Steel stated that the average composition of 382 samples of milk delivered at stations in London from the dairies of 35 farmers being members of the Eastern Counties Dairy Farmers' Co-operative Society, was: Fat 3·43 per cent., solids not fat 8·91 per cent., total solids 12·34 per cent.

Macdougald, 4831.

The results of the examination of 12,069 samples of milk were submitted by Mr. Macdougald, the average of the whole being 3·82 per cent. fat, 8·68 solids not fat, 12·50 total solids.

CONCLUSION AS TO LIMITS.

79. The Committee, after a careful survey of the evidence, are disposed to conclude that the milk produced for sale, as such, in this country contains, on an average, from 12·5 to 12·8 per cent. of solids, comprising from 3·7 to 4 per cent. of fat. This no doubt is often much exceeded, especially in the produce of herds kept for butter-making, and also under favourable conditions by the produce of herds kept for the commercial supply of milk. It is evident, however, that while the public have the right to obtain not only milk which is genuine and unsophisticated, but also, as a rule, milk which is not lower in quality than the average, it is necessary to fix the point at which a presumption may reasonably arise that the milk is not genuine, at figures which are lower than those representing the average. In arriving at those figures—*i.e.*, in fixing what should be the limits—the Committee are well aware that it is impossible to do so merely by an arithmetical calculation. It is admitted that the adoption of any of the various limits suggested in evidence would involve the possibility that perfectly genuine milk, not only from individual cows, but even from ordinarily well-kept herds, may, on occasion, though perhaps rarely and under exceptional conditions, fail to reach it. Even if this were not the case, it is evident that a limit so low as to include all possible extremes would not be consonant with either the spirit or the letter of the Section under which this Committee was appointed. The Committee have no power to suggest an absolute minimum quality—such as was advocated by some witnesses—below which milk should not be allowed to be sold. Had that been their duty, the interests of justice would have demanded the recommendation of much lower limits than those which it is reasonable to set up when the effect is to do no more than to raise a presumption of adulteration until the contrary is proved. Great as are the objections to such a degradation of the standard, they would have been outweighed by the necessity of preventing the possibility of injustice to innocent men.

Section IV., 62 & 63 Vict. c. 51.

Cameron, 2417.

80. But the fear of injustice being removed by the provisions of the law, the Committee are justified in giving due weight to all the other considerations which arise. They are bound to remember the fundamental reasons which justify and necessitate the establishment of legal limits for milk, viz., the prevention, so far as possible, of the adulteration of milk, especially in its more insidious forms. The general interests of the public in obtaining genuine milk of good quality are obvious, but the Committee cannot overlook the special interests, not only of honest milk-vendors, but also of farmers. It is evident that both these classes, and the latter especially, are seriously prejudiced by the sale of milk which has been increased in bulk and lowered in quality by the addition of separated milk or by other means. Against the continuance of this state of things there is practically only one defence—a fair and reasonable limit by which the genuineness of milk substantially poorer than the average shall be challenged. No one denies that the operation of a limit may sometimes involve inconvenience to those against whom it is not really aimed, and in whose true interests it is established. But even were the possible inconvenience far greater than has been alleged, they would wisely, and, as the Committee cannot but believe, willingly, endure it in view of the direct advantage which they obtain by the prevention of unfair competition.

81. The Committee, in view of these considerations, and duly weighing the evidence laid before them, have come to the conclusion that any milk in which the total solids are less than 12 per cent. should be further enquired into. If it should then be found that the amount of butter-fat is less than 3·25 per cent., a presumption would be raised that it had been mixed with

separated milk or water, or that some of its original fat had been abstracted; if the solids not fat are found to be lower than 8·5 per cent., a presumption that it had been mixed with water would arise.

82. The effect of regulations framed in conformity with the recommendations contained in the preceding paragraph would be, that no presumption, on analytical evidence alone, would be raised in the case of any milk of which the total solids were 12 per cent. or over. There is no doubt that milk containing 12 per cent. of total solids would normally contain at least 3·25 per cent. of fat. In the cases where, in perfectly genuine milk, the fat falls somewhat below this limit, it almost invariably happens that the deficiency in the amount of the fat is counterbalanced or more than counterbalanced by an increase in the amount of the solids not fat. The Committee in arriving at their conclusions have paid due regard to this circumstance.

83. It was suggested by more than one witness that the Board of Agriculture should give notice of any limits which they may fix, so that a period should elapse before they actually came into legal effect. It would be obviously convenient that reasonable notice should be given. Drysdale, 4469–72. Walker, 7622. Maskelyne, 9988.

Local Administration of Statutory Limits.

84. The evidence laid before the Committee tended to indicate that public analysts and local authorities are more likely to err in the direction of leniency than of undue stringency in enforcing limits. Public analysts who came before the Committee expressed themselves as being nervously anxious that any report on which a prosecution might be founded, should be absolutely accurate, and described the precautions which they took with that object. Nor is there any reason to believe that prosecutions are lightly undertaken by local authorities, or that magistrates do not give the utmost weight to every consideration which may be put forward on behalf of a vendor or producer. Allen, 4681. Macdougald, 5011.

85. But the contention was strongly urged by several witnesses that while the average milk sent out to the public may be well above the limit, it may occasionally, or in a particular sample, fall below, and a prosecution may be based on an isolated sample without regard to the general character of the milk which it represents. It must be recognised that it is possible for the milk supplied by a farmer, or sent out by a dealer, to fail on a particular day to reach a given uniform limit of quality, even although it is genuine and is usually well above such a limit. It is also possible that this exceptional occasion may coincide with the day when a sample is taken by the public authority, although the probabilities of such a coincidence are remote.

86. The system of administration adopted in Manchester appears to be devised with the object of tracing the adulteration of milk to the person by whom the offence was actually committed, or of affording each person through whose hands it has passed an opportunity of showing that it has not been tampered with. The method there adopted was described to the Committee by Dr. Niven as follows:—"The standard in Manchester is 3 per cent. of fat and 8·5 per cent. of solids not fat upon the Adams' coil method. When a retailer's sample falls below that figure, then a sample is taken from the middleman. That is to say in this way: The inspector lies in wait until the middleman's cart comes up to deliver the next supply of milk at the retailer's, and he there and then takes a sample in the process of delivery. Then he goes to the middleman, who owing to the practice prevailing in Manchester is always able to tell him from which farmer the sample has come, because they send the farmer's milk direct on to the retailer, keeping it separate. This sample taken from the middleman is submitted to an analyst, and if it in turn is inferior the inspector takes another sample at the station from the farmer who has sent the milk. If that in turn again is of inferior quality the two inspectors under the Sale of Food and Drugs Act go out to the farm and take what I call a control sample of the average milk from all the cows on the farm." Under this Bowler, 3317. Niven, 9578.

system a prosecution takes place if at any stage the milk is found to be lower in quality than that at the preceding stage.

87. This system is claimed to work very satisfactorily in Manchester, but it is possible that the conditions of the trade would not in all places permit of its adoption. A suggestion was made by some witnesses that if a sample of milk taken under the Food and Drugs Acts was found deficient, the person vending it should be kept, so to speak, under surveillance, and further samples taken at intervals, during a limited period, and that the action of the local authorities should be decided by the record against him so obtained. Thwaite, 6954.

88. The Committee are of opinion that the judicious administration by local authorities of their powers under the Food and Drugs Act, 1899, is of the highest importance. It would appear that the responsibility both for taking samples and for instituting proceedings is frequently delegated to officials. No evidence was produced before the Committee to show that this duty has not in such cases been performed otherwise than conscientiously and impartially. The Committee, however, cannot but think that the erroneous impression which prevails that the public analyst or the medical officer of health is individually the prosecutor in proceedings under the Food and Drugs Acts is one which is not conducive either to good administration or to the maintenance of the proper position of those officers.

89. The Committee are disposed to regard with favour the practice of some local authorities by which a person whose milk is reported for the first time as falling below the limit is given an opportunity of offering an explanation. To meet the allegation that the quality of milk may conceivably fall on a particular occasion below the limit under circumstances which no reasonable care or foresight can prevent, some such procedure as the following has been suggested:—When in the month of April, May, or June in any year, or when for the first time in any other month, a person is reported as having sold milk of a quality below the standard, a communication should be addressed to him by the local authority, calling his attention to the fact, and asking if he desires to submit any explanation. If he offers an explanation the local authority should consider how far it is *prima facie* reasonable. In the event of the explanation appearing to be reasonable under the known circumstances of the case, the local authority, in the exercise of their discretion, might refrain from instituting proceedings. But it would be incumbent on them to direct that further samples should be taken from time to time with a view of testing the validity of the explanation, and if in such cases the samples are found on analysis to fall below the limit it would be the duty of the local authority to institute proceedings under the Food and Drugs Acts. In the case of a sample of any milk, being the property of a milk dealer or vendor who is not himself the owner of the cows producing it, and found on analysis to fall below the limit, steps should be taken, if the vendor so demands, to obtain with all reasonable despatch samples of the milk coming from the source indicated by the vendor as supplied to him. Notwithstanding that the local authority might refrain from the institution of proceedings in consequence of the explanations offered, they should direct their officers from time to time to report specially as to the quality of milk delivered to the public, or to a milk dealer or vendor, as the case may be, by the person from whom such explanations have been accepted.

Taking Milk Samples.

90. The practical difficulty of taking a fair sample of milk is well known. Unless the whole bulk be thoroughly mixed, the rapidity with which the cream rises is liable to vitiate the result. The fact is however so commonly understood among all those who handle milk that only carelessness could cause it to be overlooked. It is admitted that inspectors and analysts exercise due care in this respect, but it was urged by certain witnesses that milk in the course of delivery or standing in a "counter-pan" for sale by

retail during the day may not be kept well mixed. It has been decided by law, however, that the onus of delivering milk of proper quality to each customer must rest upon the vendor.

91. It would appear that considerable divergence of practice prevails in taking and sending samples for analysis under the Food and Drugs Acts. The President of the Society of Public Analysts stated that he had occasionally felt very much dissatisfied with the condition of some of the samples sent him, and he and other witnesses suggested the desirability of greater uniformity in the mode of collecting and keeping samples, and Mr. Lewin stated that at the Government Laboratory similar complaint had also been made. The Chairman of the Sanitary Inspectors' Association expressed the same view on behalf of the officers charged with the duty of taking samples under the Food and Drugs Acts. The Local Government Board in February, 1894, issued a circular to local authorities on this subject, which had a beneficial effect, but there would still appear to be room for improvement.

Fisher, 3924.
Lewin, 10648.
Grigg, 6613.

Methods of Analysis.

92. Some attempt was made to show that the composition of a sample of milk varied when determined by different analysts, and one witness presented the results of a number of samples which were submitted in triplicate to three analysts with discordant results. If this represented the normal state of affairs, it is evident that similar discrepancies would be of constant occurrence in proceedings under the Food and Drugs Acts, whereas it would appear that the cases in which the public analyst and the analyst for the defence obtain divergent results are exceptional.

Stirling, 1774.
Appendix VII.

93. The importance of the method employed is illustrated by the experience of the Society of Public Analysts as described by Mr. Fisher. It appears that up to 1886 the society officially adopted the Wanklyn process of analysis. By the introduction of the Adams process, however, it was found that the more precise determination of the fat had the result of altering the relative figures denoting the composition of the same sample of milk. Thus, milk which contained 2·75 per cent. of fat and 8·75 per cent. of solids not fat when analysed by the Wanklyn process, would contain 3 per cent. of fat, and 8·5 per cent. of solids not fat by the Adams process. The various existing "accredited" methods of milk analysis were described to the Committee by Mr. Lewin, and may be tabulated as follows:—

Fisher, 3714–24.
Lewin, 10568–70.

1. Dry extraction methods - -	Wanklyn. Adams.
2. Wet extraction methods - -	Werner-Schmidt.
3. Centrifugal methods - - -	Babcock. Gerber. Leffmann-Beam.
4. Calculation method - - -	Slide Rule or Milk Scale.
5. Maceration method - - -	Government Laboratory.

94. Arising out of the evidence above referred to, the suggestion was made that the Board of Agriculture in fixing limits for milk should also specify the method or methods of analysis by which its composition, for the purposes of the Act, should be determined. Dr. Ashby, who represented the Incorporated Society of Medical Officers of Health, and is also a public analyst of long experience, said: "If there is to be an official standard for milk, it ought to be based upon an official method of analysis." Mr. Fisher, speaking as President of the Society of Public Analysts, would not advise the institution of an official method, but "would be pleased on behalf of the Society to take any steps possible to meet the officials of the Board of Agriculture with a view to an agreement as to the

Ashby, 1436.
Stirling, 1755.
Fisher, 3867.
Allen, 4505.
King, 5527.
Richmond, 8400.

methods to be adopted in the analysis of milks." Mr. Allen thought that the suggestion of certain methods by the Board of Agriculture, after due conference with those concerned, was worthy of consideration. The Committee are of opinion that action in this direction, if found practicable, would be advantageous.

Carrick, 1090–4.
Gates, 1195.
Stirling, 1840.
Speir, 2759.
Ralston, 5719.
Smith, 7037.
Prideaux, 7263, 7415.
Richmond, 8510.
Maskelyne, 9980
Lewin, 10568.

95. The centrifugal methods of analysis above mentioned were referred to by witnesses as being largely used for commercial purposes in determining the percentage of fat in milk. Not only milk dealers, but creameries and butter factories conduct their business and settle accounts with their suppliers on the basis of quality as shown by one of these machines. One witness observed that thousands of gallons of milk a day were bought and sold on the indications of the tester. Mr. Speir, on behalf of the Highland and Agricultural Society of Scotland, complained that the bottles in at least one of the three kinds of centrifugal machines afford different results, and he indicated that the bottles used at some of the creameries had been found to be "most inaccurate."

STANDARDISING TEST BOTTLES.

96. It is evident, as was pointed out, that where large sums of money are at stake the unquestioned accuracy of the apparatus by the results of which the amount to be paid is decided, is a matter of great importance. The Committee, however, understand that this subject has been recently brought to the notice of the Board of Agriculture, and that arrangements with the National Physical Laboratory are now being matured whereby the vessels used in these appliances may be officially standardised and stamped as correctly marked on payment of a small fee.

Carriage of Milk by Rail.

Hill, 84–96.
Carrick, 1133–43.
Gates, 1249.
Pocock, 1360.
Middleton, 2301–5.
Finney, 3207.
Drysdale, 4443.
Hoskins, 5241.
Ralston, 5693.
Steel, 6432–41.
Stratton, 6570.
Prideaux, 7293.
Adams, 7936–43.
Long, 8262.

Appendix XXXVIII.

97. A point referred to by several witnesses, though scarcely falling within the scope of the Committee, may be incidentally alluded to in view of the bearing which farmers in particular consider it to have on their liability to prosecution under the Food and Drugs Act. There is undoubtedly a general belief that railway companies will not convey milk, at least by the ordinary rates, if the churns containing it are so fastened as to prevent the examination of the contents. A correspondence with the Railway Companies' Association, a copy of which was handed in by Major Craigie, gives an assurance on behalf of the companies that they have no objection to the locking or sealing of railway churns. The complaint made by farmers that they are held responsible for the milk until it is delivered to the buyer, and consequently for a considerable time after it has left their control, is thus to some extent met.

SKIMMED OR SEPARATED MILK.

98. Prior to the introduction, some 20 years ago, of the centrifugal cream separator, the sale of skimmed milk to the public was comparatively small, the length of time which necessarily elapsed, under the old system of "setting" before it was available naturally impairing its freshness. The centrifugal separator, however, enables separated milk to be supplied in as fresh a condition as new milk, and thus opens up possibilities of its utilisation, which did not formerly exist.

Prideaux, 7227.

Gates, 1201.
Carrick, 1113.
Speir, 2853–5, 2891–7.
McConnell, 3145.
Drysdale, 4353.
Allen, 4506–8.
Pearce, 5113.
Ralston, 5860.
Stratton, 6482.

99. The establishment of butter-making factories, and the development of the "jar-cream" trade, have greatly increased the output of separated—as distinct from hand-skimmed—milk. The proprietor of one factory stated that he separated nearly a million gallons of milk per annum, and another factory referred to in evidence separates about 390,000 gallons of milk per annum. Some of the milk so produced is taken back by the farmers, or utilised for pig-feeding, but a very large proportion of it is sent away. It is said to be purchased for various purposes, as for instance the manufacture of biscuits, margarine and ice-cream, but a considerable portion goes directly into consumption. Several witnesses referred to the prevalence of the practice of fraudulently mixing separated with new milk, which, as Mr. Stratton observed, is "very damaging" to the interests of British farmers. Mr. Allen

said that this was "a daily practice" in Sheffield, and more than one witness referred to its prevalence in Glasgow. Professor Long gave the results of some experiments made with the object of ascertaining the quantity of separated milk which might be added to milk of average quality without causing the mixture to fall below a 3 per cent. standard of fat. The honorary secretary of the Society of Public Analysts admitted that the addition of separated milk to the extent of 20 or 30 per cent. cannot be detected. With the view of checking this practice a suggestion was made that all separated milk, as it comes from the separator, should have some innocuous substance added to it by which it might at any time subsequently be identified. One witness suggested that all churns containing separated milk should be so marked, or painted a distinctive colour. A further suggestion has been made to the Committee to the effect that the provisions of Section 7 of the Food and Drugs Act, 1899, whereby manufacturers of, and wholesale dealers in, margarine or margarine cheese are under an obligation to keep a register of consignments sent out and are also subject to inspection by the Board of Agriculture, should be applied to producers of, and dealers in, separated milk sold wholesale.

Long, 8081.
Bevan, 8987–90.
Richmond, 8465–74.
Bevan, 8995.
Adams, 7926–7.

100. The Committee are of opinion that these suggestions as to the identification or "earmarking" of separated milk are very valuable, and that steps should be taken to give effect to them.

101. Apart from the illicit use of separated milk, there is also a legitimate trade in this commodity in large towns, and it was suggested that a standard is necessary to prevent its dilution with water. Sir Charles Cameron stated that he had for a long time adopted a standard of 9 per cent. total solids, and this appears to the Committee to be reasonable.

Cameron, 2529.
Bevan, 8999.
Lewin, 10646.

102. A further question remains as to the necessity for setting up distinctive limits for separated and hand-skimmed milk respectively. Undoubtedly there is a larger amount of fat ordinarily found in the latter than in the former. By the use of the centrifugal separator it is possible to extract all but 0·1 or 0·2 per cent. of the fat, whereas milk which is set to throw up the cream will turn sour before the process is complete, and in practice hand-skimmed milk may contain from 1 to 1·25 per cent. of fat. It is stated that separated milk is sometimes sold under the designation of "skim milk," and it is contended that consumers who have by use and wont a right to expect a certain quantity of fat are thereby prejudiced.

Stirling, 1820.
Kennedy, 2007–21, 2125–30.
Chalmers, 3425–45.
King, 5488.
Steel, 6369.
Fisher, 8888.

103. It appears to the Committee that there is no sufficient justification for adopting a principle whereby the vendor of skimmed or separated milk should be compelled to leave a certain amount of fat in it. In theory the fat is presumed in both cases to be removed, and the failure in practice of the processes employed to attain perfection does not constitute a claim on the part of the consumer to stereotype their imperfection. It is hardly to be supposed that hand-skimmed milk will much longer retain a distinctive place in the market, but if it be true that the public are occasionally prejudiced or misled by a confusion between skimmed and separated milk, it would appear preferable to compel both to be sold under one and the same designation rather than to adopt a form of procedure which would tend to penalise the efficient performance of the work of cream-separation.

CONDENSED MILK.

104. Although it does not appear that a very large amount of attention has been directed, under the Food and Drugs Acts, to the analysis of condensed milk, several of the analysts who came before the Committee urged the desirability of establishing limits by which it might be judged.

105. A number of samples of condensed milk, submitted by Government departments under contracts, analysed at the Government Laboratory showed a percentage of fat ranging from 9·57 to 11·75, the degree of con-

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Fisher, 8889.
Lehmann, 10169.

densation ranging from 2·48 to 3·08, and the calculated composition of the original milk from 3·32 to 4·63 per cent. of fat. Mr. Fisher stated that brands of condensed milk were derived from milk originally containing from 4·1 to less than 1 per cent. of fat. The Committee received a considerable amount of interesting information on the subject from Mr. C. T. Lehmann, who represented the Condensed Milk Defence Association, and whose firm imports two-thirds of the whole of the machine-skimmed condensed milk sent to this country.

Lehmann, 10431.

106. There are four distinct classes of condensed milk, viz.: (1) whole milk—(*a*) sweetened, (*b*) unsweetened; and (2) machine-skimmed milk—(*a*) sweetened, (*b*) unsweetened. Mr. Lehmann stated that the unsweetened brands are not largely sold except for ship's stores and for export, and his explanation of this was as follows:—"We deal with a pretty big quantity of condensed milk, and our experience is that we cannot get the public in England—and our public is the lower-class public, not the higher-class public—to take unsweetened condensed milk. In countries where the condensed milk has been introduced more recently—in Rhodesia, for instance, where condensed milk was introduced after the rinderpest—it is the unsweetened milk that has gone ahead and which sells very much more than the sweetened milk; because there the public have had practically both kinds of milk, the sweetened and the unsweetened, offered to them at the same time, and they have, as I should do myself, naturally taken to the unsweetened first. But in this country, where the public taste has been educated to sweet milk, we cannot get them to take unsweetened milk."

Hill, 81.
Lehmann, 10455.
Allen, 4728–36.
Cassal, 9018.
Brown, 9844.
Lewin, 10631.

107. Whatever the reason may be, the fact was referred to by several witnesses that many of the condensed milks on sale contain a very large amount of sugar—as much as 40 per cent. in some cases. The effect of this is that it is necessary to add a large quantity of water to dilute them sufficiently for use. Mr. Allen mentioned one of the best known condensed milks, the makers of which say on the label that for the purpose of feeding children it should be diluted with from twelve to fourteen parts of water, and he added "seeing that it never was concentrated more than three down to one—not twelve or fourteen down to one—it means that the children who are served with that milk diluted to that extent, in accordance with the directions of the manufacturers, are starved." Other witnesses gave evidence to the same effect, and there is no doubt that the state of affairs thus disclosed is prejudicial to the health of the community. The suggestion was made by Major Cassal that the addition of sugar to condensed milk should be either prohibited, or if that were deemed undesirable, it should be made compulsory to disclose the fact on the label.

Dyer, 368.
Allen, 4728.
Richmond, 8450.
Fisher, 8890.
Cameron, 2520.
Chalmers, 3452–4.
Lloyd, 6092–6109.
Niven, 9669.
Cassal, 9018.

108. Several witnesses suggested as a simple and workable standard for condensed milk, that the proteids and fat should be in equal proportion, it being explained that this would ensure that the original milk contained about 3·25 or 3·3 per cent. of fat. Mr. Fisher stated the proposal thus: "The datum line is that the fat in the condensed milk should not be less than the proteids, and the proteids should be determined by estimating the nitrogen, and multiplying by the usual factor of 6¼." Another suggestion made was that it should be compulsory to state on the label of the condensed milk the amount of dilution required, and that when diluted to that extent it should be judged by the limits fixed for ordinary milk, or by somewhat higher limits. Mr. Lloyd, in supporting this suggestion, observed that it is usual for condensed milk, as sold to the public, to be so labelled, but where the label did not comprise such a statement he thought the condensed milk should contain 12 per cent. of fat. He stated that the best brands contain this percentage. Major Cassal thought that regard must be had to the degree of condensation to which the original milk had been subjected. He said, "In my opinion the extent of condensation may be most conveniently determined by the percentage of ash. In cases where the condensation and subsequent admixture with sugar, or otherwise, have been such as to produce an article containing 2 to 2·2 or 2·3 per cent. of ash, the percentage of fat should be not less than 9 per cent., which may be taken as a low standard."

109. The Committee consider that official limits of quality for condensed milk are desirable, and that they may be fixed at 10 per cent. of fat, or 25 per cent. of solids not fat, which would practically imply that the milk, before condensation, contained not less than 3·25 per cent. of fat. They are further of opinion that the addition of sugar to condensed milk is not required for its production or preparation as an article of commerce or to render it fit for carriage or consumption, while the evidence laid before them tends to show that it is sometimes used to conceal the inferior quality of the article. They suggest, therefore, that it would be desirable if means could be adopted to limit the amount of sugar which may be added to condensed whole milk, and to prohibit entirely its addition to condensed machine-skimmed milk.

CREAM.

110. As regards cream, the evidence showed that the term covers an exceedingly wide range of quality. It may contain apparently as little as 8, or as much as 50 or 60 per cent. of fat and still be sold under the name of cream. The custom of the trade in Glasgow was described to the Committee by more than one witness and particularly by Mr. Kennedy, President of the Glasgow Dairymen's Association. It appears that at least three different grades of cream are commercially recognized in that city, which were roughly classified as follows: (1) "Cream" containing from 9 to 12 per cent. of fat; (2) "Cream" containing from 15 to 25 per cent. of fat; (3) "Double" or "Switching Cream," containing from 30 to 50 per cent. of fat. Dr. Chalmers said, however, that cream was rarely sold in Glasgow above 15 per cent. of fat. In other parts of the country, "single" and "double" cream are recognized in the trade, one witness stating that 25 and 56·5 would represent their average percentage of fat respectively.

Stirling, 1822.
Kennedy, 2022–58.
Chalmers, 3412.
Carrick, 1016.

111. The majority of witnesses who referred to the subject of cream did not consider that any advantage would accrue from the fixing of limits of fat for that commodity, and among those who suggested limits there was considerable divergence of opinion. Mr. Speir thought the minimum percentage of fat in cream should be 10 to 20, Mr. Carrick and Mr. Ashcroft inclined to 20, Major Cassal suggested 25, and Mr. Fisher (who stated that the Society of Public Analysts made no recommendation on the subject and who personally thought a standard needless) mentioned 30 per cent. of fat as a fair limit for thin cream. Mr. Ralston and Mr. Steel also agreed to 30, while Mr. Falconer King and Professor Long suggested 40, and Mr. Prideaux 50 per cent. In very few instances, however, did these witnesses express a decided opinion in favour of limits of fat for cream.

Gates, 1241.
Stirling, 1823.
Cameron, 2525.
Richmond, 8447
Niven, 9666.
Brown, 9838.
Carrick, 1108.
Speir, 2881.
Ashcroft, 7532.
Cassal, 9018.
Fisher, 8872–81.
Ralston, 5708.
Steel, 6382.
King, 5502.
Long, 8108.
Prideaux, 7361.

112. The addition of gelatin to cream for the purpose of thickening was stated by the representative of the Dairy Trade and Can Protection Society to be a common practice, and one which he personally considered justifiable, although his society was not committed to this opinion. The adoption of the practice was repudiated by other witnesses representing the trade, and the Committee have no reason to think that its use would be generally defended. As was pointed out by many witnesses the richness of cream is roughly indicated by its thickness, and consequently the addition of a foreign substance for the purpose of giving it a fictitious appearance of thickness, is obviously a deception of the consumer, and a means of obtaining a higher price than the article, on its merits, would command. The Committee consider that steps should be taken to prevent the artificial thickening of cream by the addition of gelatin or other substances.

De Hailes, 633-42, 707–28.
Carrick, 1022.
Drinkwater, 9219.

113. The Committee are of opinion that the weight of evidence was not favourable to the establishment of official limits of fat for cream, nor does it appear that any substantial difficulty arises in selling cream in different qualities—at corresponding prices—to meet the requirements of the public. Apart from the adoption of artificial means to increase its apparent consistency, there is no proof of the prevalence of adulteration or of prejudice to the consumer which official limits would prevent. The Committee consider, therefore, that no regulations are required with regard to the amount of fat in cream.

RECOMMENDATIONS.

114. The Committee beg to make the following recommendations :—

I. That regulations under Section 4, of the Food and Drugs Act, 1899, be made by the Board of Agriculture with respect to Milk (including condensed milk) and Cream.

II. (*a*) That in the case of any milk (other than skimmed, separated, or condensed milk) the total milk-solids in which on being dried at 100 degrees Centigrade do not amount to 12 per cent. a presumption shall be raised, until the contrary is proved, that the milk is deficient in the normal constituents of genuine milk.

(*b*) That any milk (other than skimmed, separated, or condensed milk) the total milk-solids in which are less than 12 per cent., and in which the amount of milk-fat is less than 3·25 per cent., shall be deemed to be so deficient in milk-fat as to raise a presumption, until the contrary is proved, that it has been mixed with separated milk or water, or that some portion of its normal content of milk-fat has been removed. In calculating the percentage amount of deficiency of fat the analyst shall have regard to the above-named limit of 3·25 per cent. of milk-fat.

(*c*) That any milk (other than skimmed, separated, or condensed milk) the total milk-solids in which are less than 12 per cent., and in which the amount of non-fatty milk-solids is less than 8·5 per cent., shall be deemed to be so deficient in normal constituents as to raise a presumption, until the contrary is proved, that it has been mixed with water. In calculating the percentage amount of admixed water the analyst shall have regard to the above-named limit of 8·5 per cent. of non-fatty milk-solids, and shall further take into account the extent to which the milk-fat may exceed 3·25 per cent.

III. That the artificial thickening of cream by any addition of gelatin or other substance shall raise a presumption that the cream is not genuine.

IV. That any skimmed or separated milk in which the total milk-solids are less than 9 per cent., shall be deemed to be so deficient in normal constituents as to raise a presumption, until the contrary is proved, that it has been mixed with water.

V. That any condensed milk (other than that labelled "machine-skimmed milk" or "skimmed milk," in conformity with Section 11 of the Food and Drugs Act, 1899) in which either the amount of milk-fat is less than 10 per cent., or the amount of non-fatty milk-solids is less than 25 per cent., shall be deemed to be so deficient in some of the normal constituents of milk as to raise a presumption, until the contrary is proved, that it is not genuine.

115. The Committee beg further to submit the following expressions of opinion on points raised before them in evidence :—

(*a*) That it is desirable to call the attention of those engaged in the administration of the Food and Drugs Acts to the necessity of adopting effective measures to prevent any addition of water, separated or condensed milk, or other extraneous matter, for the purpose of reducing the quality of genuine milk to any limits fixed by regulation of the Board of Agriculture.

(*b*) That it is desirable that steps should be taken with the view of identifying or "ear-marking" separated milk by the addition of some suitable and innocuous substance, and by the adoption of procedure similar to that provided by Section 7 of the Food and Drugs Act, 1899, in regard to margarine.

(*c*) That it is desirable that, so far as may be found practicable, the procedure adopted in collecting, forwarding, and retaining pending examination, samples of milk (including condensed milk) and cream under the Food and Drugs Acts should be uniform.

(*d*) That it is desirable that, so far as may be found practicable, the methods of analysis used in the examination of samples of milk (including condensed milk) or cream taken under the Food and Drugs Acts should be uniform.

(*e*) That it is desirable in the case of condensed milk (other than that labelled "machine-skimmed milk" or "skimmed milk," in conformity with Section 11 of the Food and Drugs Act, 1899), that the label should state the amount of dilution required to make the proportion of milk-fat equal to that found in uncondensed milk containing not less than 3·25 per cent. of milk-fat.

(*f*) That it is desirable in the case of condensed whole milk to limit, and in the case of condensed machine-skimmed milk, to exclude, the addition of sugar.

(*g*) That the official standardising of the measuring vessels commercially used in the testing of milk is desirable.

116. The Committee, in concluding their Report, desire unanimously to place on record their high appreciation of the able manner in which their secretary, Mr. Rew, has assisted them in their enquiry. The painstaking and conscientious discharge of his duties has been of the greatest service to them in summarising the voluminous evidence laid before them and in compiling the Report.

We have the honour to be,
Sir,
Your most obedient servants,

(signed) WENLOCK.
GEO. COWAN.
P. G. CRAIGIE.
* S. W. FARMER.
SHIRLEY F. MURPHY.
T. E. THORPE.
J. A. VOELCKER.

R. Henry Rew,
Secretary,
16 January, 1901.

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* Subject to subjoined Reservation.

RESERVATION BY MR. S. W. FARMER.

As I am in entire agreement with the general tendency of the Report and also with by far the larger portion of the details thereof, I have had no hesitation in signing it. At the same time there are a few points on which I differ from the majority of the Committee, and consequently my signature is attached with reservation on these points. They comprise matters of administration in the production and supply of milk, on which I speak with some confidence, and matters analytical, on which I speak with more diffidence.

Paragraph 57, although qualified by such words as "in most instances," "whenever practicable," and similar expressions, conveys the idea that the "skilful farmer," by "skilful management," is able to "obtain a fairly uniform quality of milk all the year round." In other words it is assumed that by proper arrangements, such as the calving of cows all the year round and not particularly at one time of year, equal intervals between milking, breed of cattle, use of concentrated food and suchlike, there need be no material seasonal difference in quality. I cannot agree with any such conclusion as being applicable to the general agricultural condition of this country. Farmers, whose farms consist exclusively, or mainly, of pasture, cannot have their cows calving in autumn and winter. They have not suitable food at this time of the year for the production of milk. Their cows must calve, as far as possible, in the early spring, when they have, or should have, abundance of food. Winter milk, on the other hand, is principally produced on mixed farms, that is where there is a large proportion of arable land on which roots and other succulent foods may be grown, for winter use. On these farms, for the most part, there are but very few of the cows calving during the spring months. Of course there are farms (where the proportion of arable to pasture is suitable) on which cows can be coming into milk at all times of the year, but this condition of things does not generally prevail.

It is admitted (paragraph 58) that "the average quality of milk" is usually lower in the "later spring and early summer," and "uniformly higher in the autumn and winter months."

I hold then that there are and must be seasonal differences, and I cannot agree that it is possible for the "skilful farmer" to "obtain a fairly uniform quality of milk all the year round."

The Report states (paragraphs 37 and 39) that it is "for many farmers practically impossible to milk at equal intervals" and that consequently the evening milk is richer than the morning's by about 0·4 or 0·5 per cent. of fat.

We have then—

(1.) The autumn and winter milk richer than the spring and summer milk.

(2.) The evening milk richer by 0·4 than the morning.

And these are for the most part constantly recurring differences and are not variable like those resulting from "exceptional meteorological conditions."

It follows therefore that roughly one-fourth of the milk supply of the country is considerably poorer than the remaining three-fourths. And it does not commend itself to me as reasonable either on the one hand that the presumption shall be raised that a large proportion of this milk is not genuine because it does not reach a "minimal limit more nearly approximating to the normal quality of milk," or on the other hand that minimal limits shall be fixed for the whole year on the basis of the quality of the poor mornings' milk of the spring months. It is impossible to discriminate between the mornings' and evenings' milk, but it is not impossible to have seasonal limits.

At any rate, in my judgment, the difficulties attending seasonal limits would be much less than would result from a limit of 3·25 per cent. for the whole year, which I believe to be higher than half of the morning's milk produces in this country during the spring months.

It is proposed that the governing limit of 12 per cent. total solids should act as a corrective to this during the spring months, and it is stated (paragraph 55) "that whilst there may be occasional instances of milk containing less than 3·25 per cent of fat during these months, it is comparatively seldom that the total solids of the milk fall below 12 per cent. at this period." But no reference is made to the much more frequent instances in which a governing limit of 12 per cent. total solids would hide from investigation and screen milks containing separated milk in quantities sufficient to reduce the fat to less than 3·25 per cent., and that too at times and seasons when genuine milk should contain at least 3·25 per cent. of fat. I have examined the analyses made this year of over 1,000 samples of what I have every reason to believe to be genuine milk, of the morning's milking, taken from the supplies from about 50 different farms in various parts of the country, the samples having been taken approximately in equal number in each month of the year. I find that whilst there are 71 (7 per cent.) samples below 12 per cent. total solids, there are 178 (18 per cent.) below 3·25, per cent. fat, thus showing that 12 per cent. total solids is a lower standard than 3·25 per cent. fat.

If a milk does *not* contain 12 per cent. total solids I think it is only very exceptionally that it contains 3·25 per cent. fat. Of the 71 samples above referred to as being below 12 per cent. total solids there were only nine which had 3·25 per cent. fat or over; consequently the 12 per cent. total solids becomes almost entirely the governing factor, and the limit of 3·25 per cent. fat is largely inoperative. It is, in fact, a fictitious limit.

I think it is very little good to look for 3·25 per cent. fat where you have not 12 per cent. total solids, except possibly in the case of milks adulterated with a very small quantity of water. On the other hand, milk containing 12 per cent. total solids (especially when the total solids of separated milk are as much as 9 to 9·30 per cent.) may have very much less than 3·25 per cent. fat. It seems useless therefore to suggest that there is or should be a limit of 3·25 per cent. fat when the governing factor is 12 per cent. total solids, as this governing limit completely screens from observation the majority of samples deficient in fat.

There was practically no evidence laid before the Committee in support of the principle of setting up a governing limit of total solids.

The object of the enquiry is to prevent adulteration, and adulteration is most likely to be practised when milk is short in quantity and when it is high in price. For the most part the milk produced in the morning has to supply the afternoon's demand, and the milk produced in the evening has to supply the morning's demand. There is much less milk produced in the evening than in the morning. The morning's demand is much greater than the evening's demand. It follows, then, that the short supply of rich evening's milk has always to meet the large demand of the morning. And so, in the winter months, the supply is short and the milk is rich. Hence, when milk is short in supply it is rich in quality. So that the temptation to adulterate and the facility for adulteration always go together. On the other hand, the morning's milk of the spring months is always the most plentiful, the poorest in quality, and the least wanted. There is no temptation to adulterate this.

It appears to me, then, that the aim of the Committee should be to advise limits which will check adulteration when both the facilities and temptation are greatest.

The adoption of a governing limit of 12 per cent. total solids, whilst meeting the low quality of the spring months, admits, to my mind, of an enormous amount of adulteration at all times when milk is rich. The conclusions, then, I come to are :

(1.) I object to a governing limit of 12 per cent. total solids as being too low for six months, and also as rendering the 3·25 per cent. fat limit inoperative.

(2.) I object to the suggested limit of 3·25 per cent. fat for the whole year—

 (*a*) As being practically inoperative with a governing limit of 12 per cent. total solids.

 (*b*) As being too high for the spring months without the governing limit of 12 per cent. total solids.

(3.) I am in favour of seasonal limits, viz., 3 per cent. fat and 8·5 per cent. solids not fat for March, April, May, and June ; and 3·25 per cent. fat and 8·5 per cent. solids not fat for the remainder of the year ; or even for periods of six months for each set of limits. And I believe these would be nearer the actual condition of honest milk production than the limits suggested in the Report of the Committee.

Finally, I do not imagine that the above or any other limits would stop adulteration. Indeed, we are informed on high authority that it is impossible by analysis to detect the addition to rich milk of even large quantities of separated milk. I am therefore most strongly in favour of "Opinion" (*b*) on page 33. I believe the adoption of the course therein suggested would be of much more value in securing a pure supply of milk to the public, and at the same time be of much more value to the agricultural interest, than any statutory limits of the constituents of milk that could possibly be devised.

(signed) S. W. FARMER.

REPORT BY MR. GEORGE BARHAM.

To the President of the Board of Agriculture.

Sir,

1. As I find myself unable, after careful consideration of the evidence tendered to the Committee, to sign the Report of my colleagues or to give my assent to their principal recommendations, I have no alternative but to embody my conclusions in a separate report.

Witnesses.

2. It is not necessary for me to refer at length to the number of the witnesses and the bodies on whose behalf they appeared; their representative character will be seen from the fact that they comprised 15 analysts, 2 medical officers of health, 18 dairy farmers and landowners, 8 dairymen and representatives of dairy companies, 3 representatives of butter and cream factories, 1 condensed milk manufacturer, 1 sanitary inspector, and 1 veterinary surgeon. The societies represented included 11 that appealed to producers and 7 that were representative of the distributors.

The Subjects of the enquiry.

3. Following the terms of the reference, the enquiry included (*a*) milk, (*b*) condensed milk, (*c*) cream—the term "milk" being held to comprise skimmed and separated milk. By far the most important part of the enquiry was that relating to milk, *i.e.*, whole or new milk, and I therefore propose to deal with that subject first in order in this Report.

MILK.

Magnitude of interests.

4. In regard to an article of universal consumption such as milk it is clear that the commercial interests involved in its production, distribution, and sale are of very great magnitude. Its production forms an important branch of agriculture, and one which has, according to the highest authorities, suffered least from the depression in agriculture of recent years. It is therefore of the highest importance that the greatest care should be exercised in framing regulations by which those interests should be governed.

Difficulties of the question.

5. The difficulties surrounding the question of a standard for milk have always been recognised, and although the subject has been discussed by Parliamentary Committees sitting to inquire into matters connected with food adulteration—*e.g.*, those of 1874, 1894–1896—no official standard has yet been arrived at, nor have any specified limits been recognised by law. The task placed before the Committee was therefore by no means an easy one. Sir George Brown, the Veterinary Adviser to the Board of Agriculture, in referring to it, said: "So far as my long experience of Committees and Commissions extends, I think they have handed to this Committee about the most impossible piece of work that was ever suggested." Brown. 9812.

The difficult nature of the problem was urged by many other witnesses.

The Need for a Standard.

6. It is probably owing to the difficulties referred to above that in many quarters the opinion has been expressed that no legal and rigid standard should be fixed. Such was the view of several witnesses heard before the Committee. (Thwaite. 6989-92. De Hailes. 617, 776.) It was felt by some that a standard would be a hard and fast line that would determine whether or not a prosecution should take place, and that the discretionary powers at present exercised by individual analysts in the matter of allowances for exceptional seasons and other circumstances would be removed. Therefore if a high standard were fixed it was feared that many innocent persons would be punished. On the other hand, it was urged that the fixing of a low standard would result in milk being brought down to the standard. (De Hailes. 602–3. Pocock. 1290. Marshall. 2264. Prideaux. 7324. Ashcroft. 7514.) This latter view was not, however, shared by witnesses who had had much experience in testing milk supplied to the public. (Dyer. 427, 510. Cameron. 2449. Fisher. 4042–3.) Dr. Bernard Dyer stated in his evidence: "I do not think the result of officially stamping it would in any way tend to increase adulteration, as has been very freely suggested; I think it would be in the other direction." He further said that the limit of 2·75 used for many years past by analysts had

not caused farmers and dairymen to water their milk. He said, "The average is good, notwithstanding the admittedly low standard which we took." It was also pointed out by Sir Charles Cameron that such manipulation of the milk would require scientific knowledge on the part of farmers and dairymen, and he added, "I do not think in 999 cases out of 1,000 they would have sufficient skill to do it." This point was emphasised by Mr. Fisher, the President of the Society of Public Analysts, who said: "That kind of tampering pre-supposes a certain amount of preparation and appliances, which are impossible in nine-tenths of the cases."

7. Whilst recognising the force of the arguments brought forward by those witnesses who were opposed to any alteration of the present condition of things, it is impossible to overlook the fact that they formed but a small minority and that the bulk of the witnesses were in favour of having a standard fixed by law. It must be borne in mind that in the absence of a legal limit the standard that is adopted by the referee chemists at Somerset House as the basis upon which the amount of adulteration is estimated, is the one that has to a large extent guided and controlled Public Analysts. Under present conditions this standard can be altered by the head of the Government Laboratory for the time being, and this having, in fact, been recently done by the present head of the Laboratory it is quite conceivable that his successor may desire to have the standard reverted to the previous figure or still further increased. Such changing of the standard must of necessity result in considerable confusion, seeing that no notification of the alteration is made either to the local authorities, the Society of Public Analysts or the organisations connected with the dairying industry, and, as is at present happening, milk which is passed as genuine in some localities is condemned as adulterated in others.

8. In addition to this it appears to me that it is not desirable that the responsibility for fixing a standard should rest with the Referee Chemists at Somerset House. The value of this Department lies in the fact that it is referred to as an impartial tribunal, that it holds the balance evenly as between producer or vendor and consumer, that its functions are not to concern itself with how milk might be improved or how an ideal standard may at all times be reached, but to decide whether the article has been subjected to fraudulent manipulation or not. It would, therefore, seem that the alteration of the standard from time to time to suit the views of whoever may be the head of the Laboratory, and who may be influenced by an exaggerated conception of the claims of the consumer without a sufficient realisation of the difficulties attending the production and distribution, would tend to create a feeling of distrust in the minds of farmers and traders, and give rise to a state of things not only unsatisfactory but fraught with grave danger. It is also quite intelligible that the head of the Government Laboratory would prefer that the standard should be fixed by the Board of Agriculture rather than by himself, as in the event of his fixing a moderately low standard, he would be open to constant complaints on the part of analysts that their views, based upon a higher standard, were not confirmed by Somerset House, while on the other hand, if a high standard were fixed by him agriculturists would rightly complain that the genuine produce of their cows was being condemned as adulterated. I therefore cannot resist the conclusion that a standard or limit prescribed by the Board of Agriculture that would have due regard to the conditions of production and the peculiar nature of the article, on which the Department should be well qualified to form a judgment, is desirable.

The Question before the Committee.

9. It may be well if before proceeding with the subject of the actual standards I define my position with regard to the question before the Committee. As I interpret the reference, the Committee were called upon to satisfy themselves as to what constitutes genuine milk as produced under the present conditions of dairy farming, and to state what are the normal constituents of such milk below which it would be presumed that the milk had been tampered with Although in dealing with the evidence it will be necessary to enter into such considerations as to how the quality of milk might be improved and how uniformity might be maintained, I do not

consider that such matters strictly come within the scope of this enquiry. Neither does it appear to me to be within the province of the Committee to determine the quality of milk which, although genuine, shall not be sold to the public. I state this because I feel myself to be on different ground to some, at least of my colleagues who have put an interpretation upon the terms of the reference which I venture to suggest was never contemplated. The statement has been made to witnesses that, "It is not a question of Question 9363. percentage; it is a question of whether the milk is such as should be sold, such as the public have the right to expect." Again, "We can ask for nothing Question 6024. more than *the average product.*" *

10. Those considerations appear to me to alter the whole character of the enquiry. The manifest object of the Act is to prevent fraud, and it was clearly never the intention of the legislature to prevent the sale or penalise the seller of an article which, though of an inferior quality, is nevertheless perfectly genuine.

"*Genuine*" *and* "*Normal*" *Milk.*

11. There was a considerable divergence of opinion as to what constituted normality or abnormality in milk. Dr. Dyer stated that he Dyer. 354. regarded all milk which reached or exceeded the standard of 3 per cent. of fat and 8·5 per cent. solids not fat as normal, while all milk falling below those figures he classed as abnormal. He included under the latter heading milk which might be the produce of but one or few cows. In some cases, therefore, milk, though perfectly genuine and the product of healthy cows, would be described as abnormal, while in other cases milk would be included as normal which had possibly been adulterated. Mr. Lewin, of the Government Laboratory, gave it as his opinion that "normality practically means the Lewin. 10,678. *average composition* of milk."

On the other hand, Sir George Brown described normal milk as the Brown. 9828. "fluid which is drawn from a perfectly healthy udder of a perfectly healthy cow, living under the most favourable sanitary conditions." He added, "I should consider that to be ideal milk, whether it contained 2·5 per cent. of fat or 4."

12. It is difficult to arrive at any other meaning of the term than that given by Sir George Brown. It is known that cows in a state of bad health or suffering from an affection of the udder yield milk of an extraordinary composition, and the peculiar character of the milk given immediately after calving is also well known. Such milk appears to me to rightly come within the meaning of the term "abnormal," but it certainly seems unreasonable and illogical to describe as such all milk falling below a certain percentage, when, as admitted by Dr. Dyer, no less than 10 per cent. of the total number Dyer. 354. of samples passed by him as genuine would come under that head. Nor can the view of Mr. Lewin be seriously entertained, seeing that if normality is only to apply to average milk, all milk below that figure would be abnormal, and this would represent the produce of at least 40 per cent. of the herds of the kingdom.

13. A considerable amount of evidence turned upon the composition of *average* milk, but it must be remembered that the question before the Committee had no reference to *average* milk; the enquiry related to "genuine" milk only. It must be borne in mind that the vendor is not prosecuted upon the *average* of his milk, but on a single sample, and although that might fall below the standard it may nevertheless be the case that his *average* would be considerably above it.

VARIATIONS OF MILK.

14. The principal difficulty that the Committee had to face lay in the fact that the composition of milk varies to a very considerable extent not only from season to season, but from day to day. This is more particularly the case with regard to the percentage of fat. The influences which thus affect the character of the milk include the hours of milking, the season of the year, the atmospheric conditions, the period of lactation, the feeding, the nature of

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* The italics in this case, as in others, are mine.

the soil, and the size of the herd, and it will be seen that unless those influences can be controlled the difficulties attending the solution of the problem become very great. It is, in short, by no means a simple matter to fix—to use the words of one witness—"an artificial standard for a natural production."

Marshall. 2264.

The Morning and Evening Milk.

Hill. 171, 176.

15. The witnesses were unanimously agreed—with the one exception of Dr. Hill—that the difference in the percentage of butter fat in the milk produced at the morning's and evening's meals is at times considerable. It is stated in paragraph 37 of my colleagues' report that the "general range of difference . . . may be reckoned at not more than 0·5 per cent.," and figures were handed in by a member of the Committee—Mr. Farmer—showing that the difference in the case of milk produced by him was 0·4 per cent. Whatever may be the "general range of difference" it is clear from the evidence that the variation is very much greater in many cases, and that the degree of difference depends upon the length of the intervals elapsing between the milkings. Several witnesses gave figures to illustrate their experience in this respect, and it may be convenient if I summarise a few of the examples. The cases given are all those of mixed milks of herds, and of the genuineness of the samples there can be no question. The average difference is 1·31.

Marshall. 2222–5.
Ashcroft. 7485-91.
Middleton. 2281-4.
Curtis Hayward. 4131.

Witness.		Sample 1.	Sample 2.	Sample 3.	Sample 4.	Sample 5.	Sample 6.	Sample 7.	Sample 8.	Lowest Difference.	Greatest Difference.
C. Marshall.	M.	3·10	2·40	2·80	3·65	3·60	4·05	—	—	0·15	1·30
	E.	4·40	3·65	3·95	4·30	4·15	4·20	—	—	—	—
W. Ashcroft.	M.	3·45	3·30	3·15	3·53	2·87	3·20	2·92	3·44	0·32	1·87
	E.	4·97	3·62	3·91	4·29	4·30	4·33	4·79	4·52	—	—
W. Ashcroft.	M.	2·8	2·7	2·7	2·5	2·8	2·8	2·7	3·5	1·3	2·1
	E.	4·2	4·0	4·3	4·6	4·5	4·7	4·3	5·3	--	—
C Middleton.	M.	2·67	2·94	2·86	3·25	2·8	3·3	3·2	3·1	0·82	1·5
	E.	4·06	3·93	3·68	4·57	4·2	4·45	4·6	4·6	—	—
Colonel Curtis Hayward.	M.	2·8	2·8	2·9	2·9	—	—	—	—	1·1	2·1
	E.	4·6	4·9	4·6	4·6	—	—	—	—	—	—

Beecroft. 849, 850.
Carrick. 980.
Cameron. 2557, 2559.
Speir. 2958.
Drysdale, 4308.
Pearce. 5100.
Lloyd. 6056.
Steel. 6360.

16. In addition to the testimony of the above witnesses, Mr. Beecroft, who represented the Cheshire Milk Producers' Association, stated that he had figures to prove that the two meals varied in quality as much as 1 per cent.; Mr. Carrick said he found the variation of quality ran from 2·75 to 4·5; Sir C. Cameron gave it as his experience that the difference was something over 1 per cent., and that at some experiments at Glasnevin it was as much as 1·9; Mr. John Speir put the variation at "1 per cent. or more"; Mr. Drysdale, even with regular intervals, found the difference 0.46; Mr. T. H. Pearce from the Evercreech and Somerset Dairy Farmers' Association put the figure at one per cent.; Mr. F. J. Lloyd instanced the variation at the same percentage, and Mr. A. Steel stated it to be 1·5. It cannot be maintained in the face of the foregoing evidence that variations greater than 0·5 per cent. are only found "in avowedly exceptional instances" as suggested by my colleagues.

17. The greatest difference was shown where the intervals of milking were 16 hours and 8 hours and the least difference where the intervals were regular periods of 12 hours. This fact has led to the question whether the hours of milking can be regulated so as to ensure a more uniform product.

Intervals of Milking.

Speir. 2790.
Lloyd. 6012, 6010.
King. 5621.

18. It has been suggested that farmers should be compelled to milk their cows at regular intervals. Mr. Speir stated: A farmer "is not taking reasonable precautions if he divides his day into periods such as that we have been talking of" (sixteen and eight hours), and he further expressed the view that farmers near big towns should be obliged to send their milk

in at certain hours, apart from considerations of their customers, in order to guarantee an even quality. Mr. Lloyd suggested that farmers should be compelled to milk three times a day or mix the two milkings together, and he was of opinion that the standard to be fixed would "have to exclude the milk of cows which are milked at very uneven intervals." Mr. Falconer King, the Public Analyst for Edinburgh, urged that milking at irregular hours should be punishable, inasmuch as he would not accept that plea as a defence to a charge of adulteration. A member of the Committee suggested that "it might in a great many cases be possible for communities even to accommodate themselves to the periods of milking so as to get a more equable condition of things."

19. It must be admitted that whatever the merits of the remedies suggested above they do not err on the side of being insufficiently drastic. It was urged by one witness that it was only in exceptional cases where the milking was done at intervals of sixteen and eight hours. This, however, was accompanied by the qualification, "as far as my knowledge goes," and there can be no doubt that the evidence shows that not only is the practice very largely followed, but that it is impossible in many instances to carry on the business of dairy farming except under those conditions.

McConnell. 3069.

20. Although it was stated by one analytical witness that all milk was cooled before being sent away, this was not borne out by the evidence. There is shown to be, in fact, a great demand for what is known as "warm" milk as distinct from "rail" milk. From the evidence of Dr. Drinkwater it appears that milk is sold "warm" in Edinburgh. Mr. Christopher Middleton, from Yorkshire, spoke as to the prevalence of the practice in his district. Col. Curtis Hayward, from Gloucestershire, gave evidence to the same effect, and Mr. Pearce, from Somersetshire, further testified to the extent to which it prevailed to his knowledge. It appears from the evidence of the witnesses that in order to "catch their market" the milking must be arranged in such a way that it is impossible to avoid uneven intervals. This is not a matter of choice on the part of the farmer, but is necessitated by the demands of the consumer. A business man cannot afford to ignore "considerations of his customers," as Mr. Speir suggested should be done by the farmer. Nor does it seem just to the agricultural community that those who, living in the proximity of towns, are able to send in their milk "warm," should be deprived of the extra price which their produce is able to secure above that coming from a distance, seeing that the cost of production, particularly as regards labour, rent, and taxes, is usually much heavier than in the more remote country districts.

Ashby. 1603.
Drinkwater. 9439–41.
Middleton. 2311.
Curtis Hayward, 4144.
Pearce. 5177, 5179.

21. Another element of difficulty in connection with the hours of milking arises from the exigencies of the railway service. However desirous a farmer may be of regulating his milking so as to secure an uniform quality, he is largely subject to the arrangements of the railway companies that carry his produce. Mr. Thwaite pointed out, as an example, that on Sundays the train arrangements are generally altered, and the milk has to be sent 1 to 1½ hours earlier. The result is that the milk is smaller in quantity and richer in quality, and this is at the expense of the Monday morning milk which is increased in quantity but is comparatively poor in quality.

Thwaite. 6831.

22. To order, therefore, that the hours of milking should be approximated would in the words of Mr. Ashcroft "revolutionise the whole of the milk trade." Col. Curtis Hayward expressed the view that "in practice it is impossible," and pointed to the further difficulty arising from the scarcity of milkers, while even Mr. Speir was brought to the admission "that the exigencies of a large city are now demanding something different" from the practice of milking at equal intervals.

Ashcroft. 7494.
Curtis Hayward, 4219.

23. It would be impossible for me to commend to a Department having as its *raison d'être* the welfare of the agricultural industry the view that has been expressed that milk produced at irregular intervals should be excluded from sale. It would be difficult to conceive the great hardship to individuals and the enormous injury to agriculture generally that would result from such action. Neither can I tolerate the view that those who by force of circumstances are compelled to milk at uneven intervals should be placed in the

same category as those who are guilty of actual fraud. The Act never contemplated that the producer of a genuine article, however inferior, should come within the law as an adulterator.

Middleton. 2336.

24. It was urged with much force that as the milk which is taken after the shorter of the intervals is usually very rich in fat, the consumer is not prejudiced by the fact that the milk produced after the longer interval is poorer, seeing that on the average of the two meals he secures a milk of good quality.

25. As it would appear that it is impracticable to ensure regularity of intervals in the hours of milking, it is evident that the variations inevitable from such causes are a factor that must be taken into serious consideration in determining what standard or limits should be fixed.

Mixing the Two Meals.

Hill. 56.

26. It has been suggested that one means of overcoming the difficulty arising from these variations would be to mix the morning and evening milk. According to Dr. Hill this would appear to be very often done in the case of the milk supplied to Birmingham, but on his own showing this would mean that some of the milk would be twenty-four hours old before it was sold--*i.e.*, in the afternoon—and as the trains arriving in the morning, if his information is correct, would not be in time for the morning delivery, some of the previous day's supplies, already twenty-four hours old, would have to be left for the breakfast delivery. It will thus be seen that some of the milk would be as much as thirty-six hours old, and the condition of this in hot weather can be well imagined by those having the most elementary knowledge of the business.

Thwaite. 6831, 6833.
Pocock. 1409–10.
Appendix V.
Cameron. 2588.
Hoddinott. 7872, 7898, 7901.
Middleton. 2341, 2343.
Lloyd. 6017.
Drinkwater. 9431.

27. Everyone who has studied the subject of milk will know that nothing will contribute more to its souring than the mixing of different meals. Every practical dairyman is well acquainted with this fact. As Mr. Thwaite pointed out, "One thing in the dairy trade that we are most particular about is the mixing of the two meals. If there is anything that will turn the milk sour that will." He added that would mean ruin to a dairyman who did so. Such a practice is prohibited by many firms in their contracts with farmers. This was borne out by Mr. Pocock, and Sir Charles Cameron referred to a clause which he had had inserted in a contract which precluded the possibility of any mixing. The difficulties of such an arrangement were emphasised by Mr. Hoddinott who expressed the opinion that certain methods in vogue in Copenhagen could not be applied to this country. The preservation by the ice method was "certainly not practicable," and as to scalding the milk he was "quite sure that the public taste in London would not admit anything of the kind." Other witnesses spoke as to the impracticability of mixing, and Mr. Lloyd, who was one of the few who threw out the suggestion, admitted that there would be very great difficulty in hot weather.

It is therefore clear that the mixing of the two meals does not come within the range of practical dairying.

Averaging the Milk of a Herd.

Middleton. 2312, 2389.
Stirling. 1808–62.
Pocock. 1256.
Speir. 2757.
Appendix xxiv., Table 7.

28. While on the subject of uniformity it may be as well to refer to the point that has been raised as to the practicability of mixing the whole of the milk of a herd before sending it out. The possibility of the produce of five or six cows giving naturally poor milk being put into one churn was referred to by Mr. Middleton and Mr. Stirling. The former said he made it a practice to mix the whole of his milk together, and he could see no difficulty in the way of this being generally done. He, however, afterwards qualified this by stating: "That is, where it goes away at once. I would not say so if it had to be cooled . . . . the refrigeration must go on during the whole process of milking." It therefore follows that where milk is cooled before being sent away the individual churns would in most cases vary, and each churn would not be exactly an average of the production of the herd. This is indeed borne out in practice and by the evidence of such men of experience as Mr. Pocock and Mr. Speir, and also by the table handed in by Mr. Richmond on behalf of the Aylesbury Dairy Company, Limited.

Seasonal Variations.

29. It is generally acknowledged that the composition of milk varies according to the season and that the percentage of fat in milk yielded in the spring and early summer months is invariably smaller than at other periods of the year. There was a general consensus of opinion on this point on the part of the witnesses. The causes which operate in bringing this about are to be found in the fact that the greater number of cows calve down in the early spring and summer, and the milk of newly calved cows, being then in full flush, is not of a very rich character, and also that the effect of the young grass on cows freshly turned out to pasture is of a nature such as to stimulate a large flow of milk, which is naturally poorer in fat than when the quantity is more restricted. To overcome this difficulty it has been suggested—(*a*) that farmers should regulate the calving of their cows, so that a certain percentage of "stale" cows should be in milk when in the ordinary course the milk would be falling off in quality, and (*b*) that the natural food should be supplemented by the purchase of cake and other concentrated food during the spring and early summer months.

Regulating the Calving.

30. No doubt more could be done in the direction of securing uniformity if it were possible for farmers to arrange for calving a certain number of cows each month all the year round. But I take exception entirely to the assumption that this can be done by dairy farmers generally throughout the country, and that it is "a question of cattle management to be left to the skill and resourcefulness of farmers." Nor can I associate myself with the majority of my colleagues in describing as "small seasonal changes" such considerable variations as are well known to occur by all practical farmers, or with their opinion that the difficulties associated with their occurrence are "minor" ones and can be met as they suggest.

31. I cordially endorse the views of my colleague, Mr. S. W. Farmer, in paragraph 2 of his Reservation, particularly where he states, "Farmers, whose farms consist exclusively, or mainly, of pasture, cannot have their cows calving in autumn and winter. They have not suitable food at this time of the year for the production of milk. Their cows must calve, as far as possible in the early spring when they have, or should have, abundance of food." It must also be remembered that the cow will not always accommodate itself to its owner's plans, and to alter the period of calving to the autumn and winter in the case of cows that had previously calved in the spring would necessitate so great a re-arrangement that the business of the dairy farmer would be considerably disturbed and hampered, and the loss in having to keep unprofitable cows for a prolonged period would be very great. It is clear that any such arrangement could only be attempted where the number of cows is comparatively large, and therefore small owners would be left out of that consideration.

32. The supply of milk, like that of other commodities, must be regulated
according to the demand. London and other large centres require their
largest supply in May and June, and a greatly diminished quantity in August Thwaite. 6864–6.
and September. If it were possible to regulate the calving so as to ensure Adams. 7955.
a uniform production it would follow that at the times of greatest demand
there would be a danger of the supply falling short, while at other times
there would be a surfeit and a waste in consequence.

Augmenting the Natural Food.

33. To most people it would appear that the most suitable food for a cow is that which nature itself provides for her, and this is evidently the view of the animal herself, since in many instances, when the cows are first turned out, they refuse the artificial food so long as they have access to the more succulent grass. If this were not the case the question would still remain whether it is right to insist that a farmer, who during the winter months may have had to keep his cows largely upon purchased foods, should

have to incur further expense for artificial food just at the time when the natural food provides the cow with all that is necessary for its sustenance and healthy condition. The further question as to how far the feed affects the milk may be better dealt with under a separate heading.

Climatic and Atmospheric Influences.

34. Several witnesses impressed upon the Committee the necessity for taking into consideration the variations occasioned by changes of temperature and by such conditions as prolonged drought or excessive rainfall. Mr. J. A. Smith, who represents the East Suffolk Chamber of Agriculture, and who is himself a farmer of wide experience, said: "I imagine there is no part of England that is subject to such serious variations as we are in the Eastern Counties. We suffer under great disabilities." Other witnesses spoke as to the effect of a wet season upon the fats. Mr. Pocock gave as his own experience an instance of what he termed the "wretchedly poor quality" of milk produced during a period of excessive rain. Mr. Carruthers said that "during the three flood months" he "had any amount of samples, that did not average more than 2·6 or 2·7." Mr. Prideaux said he got poorer milk as a rule in wet weather, and Mr. Hoskins stated that a wet May affects the quality a great deal. On the other hand a drought is found to reduce the solids not fat, and to bring them so low as to raise a suspicion that the milk has been watered. The effect of excessive heat was illustrated by Mr. Marshall, who gave an instance where the milk had varied in four days from 2·69 to 4·90. This he could only account for by the fact of the cows "galloping with the heat." These contentions are not disputed and as the influences which govern the variations cannot be controlled or provided against, it is necessary that allowance should be made for them in considering, the fixing of a standard.

Smith 7000.
Pocock. 1257.
Carruthers. 2662.
Prideaux. 7353.
Hoskins. 5238.
Marshall. 2202.

The Size of the Herd.

35. Another factor which influences the degree of variation in milk is the size of the herd. It will be readily understood that where a few cows only are kept the susceptibility to variation must be greater than where the herd is a large one, and in cases where the origin of the milk is known this is taken into consideration by some analysts. Dr. Dyer, in reference to this point, said as regards certain cases, "I consider there was some reason for the case being viewed without strict arithmetical reference to the ordinary standard." Sir Chas. Cameron also recognised the necessity of making allowances in the case of small farms, and the same view was expressed by Mr. Speir. Other witnesses, including Mr. Middleton and Colonel Curtis Hayward, spoke as to the disadvantages that the owner of a few cows was under, in the matter of a standard, owing to the greater variation in the quality of his milk over that of a large producer.

Dyer. 357.
Cameron. 2431, 2486.
Speir. 2707.
Middleton. 2387.
Curtis Hayward. 4140.

Other Causes of Variation.

Hoskins. 5247.
Smith. 7016.

36. Several other reasons were put forward by witnesses to account for the variations in milk, such as change of milkers, careless milking, unskilful handling, etc. Although these may indicate the great difficulties which the producer has to face, it is obviously impossible to suggest any regulations which would cover such contingencies, and at the same time give reasonable protection to the consumer.

37. It is clear that any "minimal limit" which may be fixed must be such as would not raise the presumption that the bulk of the milk produced at the morning meal is adulterated, or that would exclude a large portion of the milk produced in the spring months, when the quality is relatively low. I would not go so far as to say that it must necessarily include the milk of one cow whatever the quality might be, but it should certainly include the herds of small owners, consisting of four or five cows, and should have regard to exceptional atmospheric conditions, otherwise prosecutions would be frequently taking place, and much friction would arise through farmers being often called upon to prove the purity of their supply.

IMPROVEMENT OF THE MILK SUPPLY.

38. It does not appear to me, as I have previously stated, to be any part of the duty of this Committee to enquire as to how the present quality of the milk supply may be improved. The reference applies to "genuine" milk and can only include milk as at present produced under the ordinary dairying conditions of the country and not to "ideal" milk which might or might not be produced under certain other conditions. A considerable amount of evidence was, however, received by the Committee on this subject and several witnesses made recommendations as to a standard which they were fully aware could not be reached by the general body of dairy farmers at the present time. Mr. Drysdale who advocated a standard of 3·0 per cent. suggested that a notice of from 3 to 6 months should be given. Mr. Macdougald thought the standard might start at 3 and be increased to 3·25 after notice. Mr. Ralston admitted that in order to reach his ideal of 3·25, some four or five years would have to elapse and that "farmers should be educated up to that." Dr. Niven who recommended 3·0 per cent. would give farmers 12 months to come up to it; Mr. Walker thought that some notice should be given to farmers before fixing a limit and that 3·25 was too high to start with, and Mr. Story Maskelyne who recommended a standard of 3·25 admitted that a good many farmers would be below it and suggested that 12 months' notice should be given.

Drysdale. 4472.
Macdougald. 4966.
Ralston. 5909.
Walker. 7622.
Niven. 9611.
Maskelyne. 9991.

39. In view of the foregoing and of the prominence which my colleagues have given to the possibilities of levelling up the quality of the milk of the country, it is necessary to consider what are the means by which it is suggested such an improvement may be obtained.

The Influence of Feed.

40. No subject connected with practical dairying has given rise to more discussion of recent years than the influence of food upon the quality of milk, and it is not surprising that there should be much diversity of opinion on that point among the witnesses. It is clear that if the quality of milk can be regulated according to the character of the food supplied the question of levelling up to a particular standard is relieved of one of its greatest difficulties. Some of the witnesses were undoubtedly influenced by this consideration in making their recommendations, and Mr. McConnell went so far as to say that the use of such food as mangolds and brewers' grains should be given up. That this, however, would not meet the difficulty in all cases is shown by the evidence of Mr. Middleton, who never uses brewers' grains, and who, notwithstanding the fact of his feeding with food of a high albuminoid ratio, found great difficulty in getting a percentage of 3 per cent. of fat in the morning milk. He said, "I adopted all the changes I could in feeding, but I could not get it to ensure the 3 per cent. of fat in the morning during April in that year." Mr. F. J. Lloyd, on the other hand, who spoke as a scientific man, was emphatic in his conviction that "the composition of milk is affected and can be affected by feeding," and this view was shared by Mr. T. H. Pearce, who from his experience as a farmer found that the feeding influenced both the quality and the quantity of the milk.

McConnell. 3130.
Middleton. 2281, 2361.
Lloyd. 5986.
Pearce. 5154–5.

41. The great preponderance of opinion, however, was that the feeding exercised little, if any, influence upon the quality, although its effect upon the quantity was considerable. Where a difference was noticeable at all it was only a temporary one, and after a short time the milk returned to its former composition.

42. Of the practical farmers who supported this view, Mr. C. Marshall, who spoke from the experience of a long life, gave several instances of cows who with very heavy feeding, including a liberal amount of concentrated food, yielded milk of an "exceedingly low quality." Referring to a run of unusually low samples, he said, "We find that, let us feed as we like." Mr. Beecroft, a farmer of thirty years' experience, said, "I am quite sure that I have land that even with high feeding would not produce milk of more than 2·75, whereas I have land that would produce quite up to 2·75 without high feeding." Mr. Speir, who has devoted many years to the investigation of this subject, has come to the conclusion "that the influence of feed" as to

Marshall. 2196.
Beecroft. 815.
Speir. 2776–7–9, 2838–40.

Ralston. 5897.
Ashcroft. 7491.

quality "is not so great as is generally supposed," and that if he were told that "a certain procedure of feeding would produce milk and 3·5 per cent. of fat, and another one would only produce milk and 2·75 of fat," he would "accept it with a grain of salt." Mr. Ralston, a farmer of wide experience, and having the management of a large estate, also expressed the view that the quality would not be altered by feeding. Mr. Ashcroft gave examples of cows fed on a mixture of decorticated cotton cake, bean meal, and linseed cake that yielded milk with only 2·8 per cent. of fat in the morning, although the same cows fed on "almost the same food" gave milk at 3·44 at another time, and this not in the most favourable month, but in April.

Cameron. 2417.

The opinion of Sir Charles Cameron was to the same effect, and in reference to some experiments with extremes of feeding, he said: "I find that the results of the rather poor feeding was that the first effect was produced upon the weight of the animal and not upon the milk; the animal began to get thin, losing its weight, though there was not very much effect upon the quality of the milk."

Brown. 9881.
Smith. 7009.
Finney. 3187.

43. Sir George Brown was of opinion "that the whole of the evidence all over the civilised world goes to show that it (feeding) has practically little or no effect." If the contrary were the case, it would not then be just that a farmer should be penalised for using a particular food, such as mangolds and grains. The evidence shows that these foods are largely used in the Eastern Counties, in Derbyshire, Staffordshire, Leicestershire, and elsewhere, and as it has been shown that their injudicious use is apparent in the loss of flesh of the cow it is obvious that it is to the farmer's interest not to feed those foods exclusively.

The Land.

Pocock. 1257.
Beecroft. 815.
McConnell. 3161.
Hoskins. 5317.
Stratton. 6515.
Adams. 7922.

44. There is more to be said for the view that the nature of the soil influences the quality of milk. Hence we hear of certain districts being good dairying land, and others poor dairying land. Mr. Pocock gave an instance of the quality of the milk differing when cows were turned from one field into another adjoining. Mr. Beecroft, as stated in the foregoing remarks on feeding, referred to the variations in quality of milk produced on different land. Mr. McConnell, speaking of land in Northumberland on the "millstone grit," said "they can scarcely get the milk up to 3 per cent." Mr. Hoskins said, "it is a well-known fact that they do differ field to field," and the same view was expressed by other practical farmers.

McConnell. 3157, 3161.
Maskelyne. 10130.
Question 844.

45. As a means of overcoming these variations it has been advocated that land which cannot produce milk of a certain quality all the year round should not be used for dairying purposes. Mr. Primrose McConnell said: "There is a lot of dairying done on land that is really not suitable for it, and which naturally produces a low quality of milk. Consequently if the public are to be protected, they (the farmers) *ought to have no mercy shown to them.*" "They ought not to have cows at all." Mr. Story Maskelyne was of opinion that land which could not produce milk up to the standard—his recommendation was 3·25—should be devoted to something else. Such an eventuality was also apparently not absent from the minds of some of the members of the Committee, having regard to the suggestion of one member to a witness, viz., "In judging what sort of milk the public is to have you might very well exclude such land out of consideration."

Smith. 7063.

46. It is very evident that the imposition of the limit suggested by my colleagues would cause a great deal of land to go out of cultivation, and a large number of farmers and landowners would be injuriously affected thereby. Mr. J. A. Smith, speaking from his wide knowledge of land in the Eastern Counties, said, "I think some lands would have to be given up entirely," and specified particularly certain districts lying between Saxmundham and Beccles.

47. It by no means follows that land which does not give the best dairying results can be adapted to other agricultural purposes. It is well known that within recent years a considerable number of farms were lying derelict in Essex and other Eastern Counties, owing to the impossibility of

carrying on ordinary farming operations upon them to a profit, and not until they were taken up for dairying purposes, mainly by farmers from Scotland, was it possible to place them again under cultivation. The land is still poor, but the farmers are able to live upon it, and to use the words of Mr. Smith, "it would be very unfair to draw the net so as to catch such Smith. 7063
men as those."

48. It follows that land which cannot be profitably cultivated for wheat growing can be, and is, used for purposes of dairying, and it must be borne in mind that the effect of putting dairy stock upon poor land is to improve that land, and therefore it must be in the true interests of agriculture and of the nation that nothing should be done to lessen the number of farms occupied under such circumstances.

49. Paragraph 23 of my colleagues' Report says:—"It cannot be doubted that there must be land which is unsuited to the keeping of dairy cows, just as there is land unsuited to wheat growing, etc." The analogy between the case of the wheat grower and the milk producer is not a sound one seeing that in the former case, whether the land is unsuitable or not, there is nothing to prevent the farmer from selling the produce, and there is certainly no law to punish him for producing his wheat on such land although the wheat may be greatly inferior to that grown on land of better quality. Whether he does so at a profit or not is a matter which concerns him alone, just as in the case of every other producer. But with the dairy farmer the effect of eliminating "unsuitable" land from consideration, in fixing a standard, would have the effect of placing the occupier of such land in the position of a criminal.

The Breed.

50. There can be no disputing the fact that the question of breed more largely influences the quality of milk than any other consideration, and it is generally recognised that attention is paid to this point according to whether the milk is required for butter or cheese-making or for ordinary consumption. It is also agreed that the breeds of cattle which give the richest milk also give as a rule the smallest quantity. It is therefore only reasonable that those who produce milk for immediate sale should be attracted to those animals which yield the largest quantity and hence the non-pedigree Shorthorn cow has become the milking cow of the country. It is not the fact, as stated in par. 35 of my colleagues' report, that the great majority of the herds kept by farmers engaged in the milk industry are cross-bred. Other breeds are used in different parts of the country to supply the demand for fresh milk, such as the Ayrshires in the Eastern Counties and Scotland, the Redpolls in Suffolk and Norfolk, and the Kerries in Ireland. A standard, however, that would be applicable to Shorthorn cows would not press heavily upon these breeds which maintain, and sometimes exceed, the quality of the milk produced by the heavier milking animals.

51. It may be taken that the improvement of a herd as regards the quality of milk produced can be secured in three ways:—(*a*) by breeding only from cows giving milk of high quality; (*b*) eliminating or killing cows giving milk below the standard; (*c*) by the addition of animals of a rich milking breed.

Eliminating Cows.

52. It was the view of Mr. McConnell that cows that did not give milk McConnell. 3131.
of good quality should be eliminated from the herds. Dr. Chalmers gave Chalmers. 3474.
the opinion that cows seven or eight years old should not be kept for the pro- Ashby. 1436.
duction of milk; and another medical officer, Dr. Ashby, also suggested that cows giving abnormally poor milk should be weeded out. The same opinion was expressed by Mr. Lloyd and Mr. Ralston, the latter of whom admitted that Lloyd. 6010.
25 per cent. of the cows would in that case have to go, and, he added, "I Ralston. 5902.
think it would be a good thing, too." Mr. Story Maskelyne was equally Maskelyne.
emphatic on this point, and asserted that he would be prepared to reject 10133–4.
half his herd if their milk did not come up to his standard of 3·25, and that he had in fact eliminated 15 per cent. of his cows for this reason as the result of one test.

Stirling. 1810. 53. Strong exception was taken to these views by several of the witnesses. Mr. Stirling, in referring to the fact that 20 per cent. of the representative dairy stocks round Glasgow were under 3 per cent., said: "It remains a big order for any Board to say, 'We will force the farmer to put Middleton. 2349. these cows out of his stock.'" Mr. Middleton said, "It is an unfair thing that a farmer should have to sell off—in some cases it might be—a large proportion of his herd. Getting rid of your cows entails a considerable loss Curtis Hayward. 4281–3. on each cow sold." Colonel Curtis Hayward held that it was not fair to call upon a farmer to kill off heavy milkers which in two or three weeks might be diminishing their quantity when the quality would go up, and Smith. 7007. similar views were expressed by Mr. Smith.

54. A great deal has been said about the liability to variation of the Lloyd. 5972. milk of individual cows. Mr. Lloyd, in his evidence, said:—"From my study of this abnormal milk it seems to me that every cow has its own peculiar abnormal condition." It is, therefore, probable that every cow at some time or other would, if tested sufficiently often, be found to be producing milk of a composition lower than the standard, and if all such were to be killed off or their milk kept back it would be a serious matter indeed for the dairy farmer. The farmer would in that case be often losing his heaviest milkers just at a time when he would be looking for an increased flow to set off the scarcity of the winter months. Certainly it would be so if the suggestion of the age limit of Dr. Chalmers were adopted, seeing that between the age of seven and eight a cow is usually at her chief period of lactation and profit. Then, it would often happen that a cow whose milk is relatively poor at one time would give milk of a high quality at another. It could not be said that a herd, giving 3·52 per cent. of butter fat in the morning and 4·91 per cent. in the evening was inferior, yet from a herd such Middleton. 2281. as this Mr. Middleton stated that he could not get an average of 3·0 per cent. in the morning in the month of April.

55. The number of the cows affected by these proposals has been variously estimated at from 10 to 25 per cent., and as these would include the heaviest milkers it is difficult to imagine how the supply of milk would be made up to meet a demand which is continually increasing. It would in all probability mean an increased cost to the consumer without any commensurate results to the producer. The milk-producing industry has hitherto been essentially a home one, but a curtailed supply and an increase in the cost of production would, in my opinion, stimulate foreign producers to enter into competition with the British farmer, and enable them to secure a market which less favourable conditions have so far kept closed to them.

56. If such cows were eliminated they would either have to be killed or sold to other dairymen. In the latter case, seeing that there is no outward sign by which a purchaser could recognise the inferiority of their milk, the cows would change hands very frequently, and would be the means of a presumption being raised against their successive owners. It would therefore appear that the only desirable course to adopt would be to kill them outright, and as this would be done for the benefit of the community, the State should be called upon to recompense their owners.

The Introduction of Channel Islands Cows.

57. The suggestion has been made that the average quality of milk pro- Ashby. 1559. duced by a herd might be raised by the introduction of one or more cows of the Channel Islands breeds. That this is "a simple and effective method commonly resorted to," as stated in the Majority Report, is not shown by the evidence, nor is it borne out by the practice of dairy farmers throughout the country. It is obvious that there are serious objections to such a proposal. Middleton. 2336. Mr. Middleton in reply to a suggestion that by this means he could place his morning milk beyond dispute said, "The average of my morning's and afternoon's milk is always higher than any standard that will ever be fixed, and I do not see why I should give the consumer the benefit of my Guernsey milk in addition to that." It must also be remembered that the yield of a Channel Islands cow is small, and it would require the milk of several animals to make an appreciable effect upon the produce of a large herd. The total number of cows therefore that would be required in order to level

up the produce of herds of this country would be very great, and several years would of necessity have to elapse before the demand could be satisfied. The introduction of Jersey or Guernsey cows would add to the expenses of the dairy farmer as it is a recognised fact that they are not so profitable from the milking point of view as some other breeds, or for sale afterwards to the butcher. The less hardy constitution of these animals also presents a difficulty to their introduction in the more Northern and Eastern districts of Great Britain. The suggestion is in my judgment, one which admits of no justification unless the principle is accepted that the consumer has the legal right to demand milk of a higher quality than that yielded by a particular breed, even though that be the prevailing breed of the country. From that view I entirely dissent.

Toning up Milk.

Maskelyne. 9972.

58. The suggestion was made that milk of a poor quality should be toned up to the standard, but it will be readily understood that this cannot be done by the farmer, and even if it could be done by the distributor, a sample might be taken in course of delivery to the latter, for which the farmer would be held responsible.

Richmond. 8358.

The mixing of the milk of different churns and from various sources which was suggested by some witnesses is a practice which I cannot sufficiently condemn. Although it is done in the case of the Aylesbury Dairy Company it is open to the grave objection that in the event of the possible contamination of one supply it would be communicated to the whole of the milk, and might be the means of spreading disease over a very much wider area than if each supply were dealt with on its own merits.

There does not appear to me to be any justification for the contention that all milk must be brought to a uniformly high quality any more than wheat, barley, meat or other produce which are subject to similar conditions. For example, a bad hay harvest means inferior milk as well as inferior meat, and a farmer cannot possibly make up for that.

"STANDARD" OR "MINIMAL LIMIT."

59. I have intimated that it is desirable, in my opinion, that regulations such as indicated in the reference to this Committee should be made by the Board of Agriculture but before discussing the basis upon which those regulations should be applied it is necessary that some reference should be made to the terms that have been used in connection with this portion of the enquiry.

Lloyd. 6043-4.

Middleton, 2289, 2293.

Speir. 2701.

60. My colleagues in their report have substituted the words "minimal limits" for "standard," but the former term was not used during the enquiry, and it must not be assumed that the references to "standards" were in every case intended to apply to "minimal limits." The Majority report in par. 15, however, states that the word "standard" is not to be understood as meaning the degree of quality which milk vendors must merely aim at reaching, but as the one below which the article they deal in should not fall. Some of the witnesses discriminated between a "Standard" and a "Limit." Mr. Lloyd, for example, put his "standard" at 3·0 per cent. of fat, but made his limit, viz. :—the line at which the prosecution for adulteration should be instituted 2·7. There is no doubt that the regulations of the Board of Agriculture would be applied more rigidly than the standards which have hitherto been recognised and this circumstance has undoubtedly led witnesses to qualify their recommendations of certain standards. Mr. Middleton who had raised his standard from 2·75 to 3·0 said :—"If it was to render me liable to prosecution, I should not recommend such a standard." Clearly then this could not be his "minimal limit." Similarly, Mr. John Speir, who personally recommended 3·25, stated that if it was to be a definite standard under which vendors would be prosecuted he was "not inclined to go something further than 3," and he considered that a legal standard should be elastic to a very great extent otherwise actual hardship would result.

Carrick 1006.

Mr. Carrick was of opinion that 3 per cent. was not a safe limit if there had to be a prosecution, unless he could get *direct evidence of adulteration.* Several of the analytical witnesses advocated a standard on the assumption that a certain amount of deficiency would be allowed before the presumption of fraud was raised.

Ashby. 1472, 1583–4. Dr. Ashby put the matter succinctly thus: "If it is not a hard and fast standard that must be absolutely adhered to, I think that is all the more reason why we should try to raise the standard." He suggested a standard of 3 per cent., but in referring to a sample of milk containing only 2·85, said he certainly should not think of prosecuting for such a slight deficiency as that.

Dyer. 396, 513, 516. Dr. Dyer said that the analyst "cannot be merely a calculating machine." He must, in certain cases, test for ash otherwise a standard of 8·5 and 3·0—which he himself recommended—would work unjustly."

Fisher. 3802. Mr. Fisher stated that analysts had been compelled to vary the standard from season to season and that "it would be unwise for them not to do so
Hill. 229. in exceptional seasons," whilst Dr. Hill, referring to his deviations from his present standard of 3·0 per cent.—notwithstanding which he advocated 3·5—said that it was "a matter of common sense, expediency, or discretion, or some other influencing motive."

Macdougald. 4959. Mr. Macdougald introduced a further reservation in the statement that it "depended altogether upon whether this limit is intended to be sufficiently low to make it quite certain that anything lower will be adulterated or whether the object in making the limit is to regulate the milk supply of the country and make it a fair and normal supply." If the latter, he thought it might be 3·0, or 3·25 per cent.

62. My colleagues having committed themselves to *minimal limits* "below which milk should not fall," it is clear that the discretionary powers of analysts as hitherto exercised in reducing the standard to meet unfavourable conditions can no longer be taken into account. So long as the standards suggested are qualified by witnesses in the manner above stated there can be no justification for defining them as "minimal limits."

"*Raising a Presumption.*"

63. There appeared to be some misapprehension on the part of witnesses as to what was implied by the term "raising a presumption." In some cases the term was associated with the idea that an intermediate process, by which an opportunity, before prosecution, would be afforded of ascertaining whether or not the poorness of milk was due to any other cause than sophistication or
Speir. 2701. adulteration. Mr. Speir, for instance, referred to "a buffer between the
Drysdale. 4445. prosecuting agent and the court." Mr. Drysdale suggested a reference to
Middleton. 2293. the herd "before anyone was prosecuted." Mr. Middleton recommended his standard only on the assumption that a prosecution would not follow in cases where milk was below it until an opportunity was given of explaining the reason. It is clear, however, that such a process is not contemplated by the Act. The words "until the contrary is proved" implies a legal process
Fisher. 3819, 3825. and a legal proof. Mr. Fisher, speaking on this point, said, "I do not see how you can call upon a man to show that" (reasons for departing from an average), "except by prosecuting him." "It must be in a court of law as far
Hill. 236. as I can see." That prosecution must necessarily follow in the case of a presumption being raised is evident. There can be no other object in raising a presumption by law. Such an interpretation has, in any case, been in the minds of the Committee, the position being defined by Professor Thorpe in a
Cameron. 2422. question to Sir Charles Cameron, viz.:—"The present condition of things"
Curtis Hayward. 4163. (under the new Act) "is that the standard raises a presumption and throws the onus of proof upon the person *incriminated*," and also by the statement, "It is obviously open to that person *to satisfy the Bench.*" A person cannot very well prove his innocence until he is accused, and the fact that the proof, in the case of milk, must be in a court of law does not appear to me to have been sufficiently recognised by many of the witnesses. If it had been so, it is certain that in several cases the standard would have been lower than was actually recommended.

64. How seriously this affects those engaged in the industry, particularly the distributors who are the first to suffer, is seen when it is remembered that the penalties under the new Act have been considerably increased, and now amount to a maximum of £100, or imprisonment, for the third offence. The responsibility upon their shoulders is therefore a very serious one, especially to those firms who are daily sending out the milk produced on four to five hundred farms situate in all parts of the country.

The Appeal to the Cow.

65. It has been urged that an accused person is in a much better position under the new Act than he was formerly, and for that reason the standard might be increased. This, however, cannot be the case, seeing that the new Act establishes for the first time a principle that is contrary to the traditions of English law in that it assumes a person to be guilty before his guilt is proved. It has always hitherto been a feature of the administration of justice that a person is held to be innocent until his guilt is established. But it has been maintained that a safeguard is in this case provided in the opportunity afforded an accused person of what is known as "an appeal to the cow." The noble Chairman, in referring to this point, stated that a vendor "would be quite safe under the present law by taking the inspector down to see the cows milked." A great amount of evidence was received on this subject, and the whole of it tended to establish the fact that such a safeguard was not only illusory, but might actually be a danger.

Cameron. 2428.
Smith. 7051.

66. It must be remembered that no action could be taken by a vendor unless the quality of his milk were impugned, and a week or ten days would elapse before he received an intimation that he was presumed to be guilty of fraud. If it were then possible to trace the particular cows from which the milk was obtained, it by no means follows that the composition would be the same as that given ten days or more previously; it is almost certain that it would be different. This point was emphasised by all the practical farmers among the witnesses. Mr. Marshall gave an instance of the milk of a herd varying as much as from 2·69 to 4·90 in four days, and speaking of another case said, "If I appealed to my cows in that way four days after, the cows would have said I was a liar." Mr. Ashcroft referred to an appeal to the cow which showed a variation of 2·87 to 3·20 in four or five days. Mr. Speir stated that unless the reference were made within forty-eight hours it would not be of much value. Mr. Middleton stated that in the interval "there may be a variation . . . which might help to condemn the man appealing," and the same view was expressed by Mr. Thwaite and others. Mr. Carrick agreed that a difficulty would arise in the event of the cows having been turned out to pasture or put into winter quarters, with a change of food in the interim.

Marshall. 2202, 2196.
Ashcroft. 7486.
Speir. 2955.
Middleton. 2295
Thwaite, 6805.
Bowler. 3336.
Drysdale. 4448.
Lloyd. 6069.
Carrick. 1010.

67. It is, therefore, evident that it would not be safe to judge the product of one day by that of another. The sample taken at the farm would itself be taken as the standard, and in the event of it showing a higher percentage than the sample which had raised the presumption, the offence would in the eyes of the law be aggravated and the costs considerably increased.

68. It was pointed out by some witnesses that it would be impossible where large herds are kept to trace back from which cows the milk in a given churn came. Mr. Hoddinott argued, "How are you going to get a proof beyond that?" (the analyst's certificate). "The milk—that day's and that cow's milk—is all gone and done away with, and no other sample can be taken. It cannot be proved." . . . "It is impossible to get the proof for that particular day." Professor Long stated, "If the milk is taken in the London streets . . . nothing can possibly, in most cases, fix the herd from which that milk came." A case in point is that of the Aylesbury Dairy Company who, according to the evidence of their representative, tone down their best milk and level up their poor milk, by mixing from ten to twenty churns together. In the event of a sample of such milk being taken the difficulty would arise as to which of the herds they should appeal to—the

McConnell. 3114–8.
Hoddinott. 7720, 7727.
Long. 8099.

Speir. 2729.

one giving the rich milk or that giving the poor milk. The suggestion of Mr. Speir only served to emphasise the difficulty. The method he illustrated was "that the person taking the sample might return to the cowshed where the milk came from, the following meal, if you might so express it, if he knew in plenty of time, and ask to see the whole of the cows milked, and draw an equal sample from each, and then submit that." How impracticable this would be is apparent when it is remembered that some milk is brought more than a hundred miles, and that the incriminated sample could only be the produce of a few cows, and not the average of a herd.

Stirling. 1878.
Curtis Hayward. 4163.
Smith. 7051.
Fisher. 3848.
Lloyd. 6067.

69. Another serious objection was referred to by many witnesses, viz., the odium that would attach to a man being presumed to be guilty and compelled to vindicate his innocence in a court of law. Mr. Fisher said, "It is a question in my mind whether an innocent man ought to be compelled to do that," and Mr. Lloyd pointed out that "it is a very serious matter to prosecute a farmer for fraud unless there has actually been fraud."

Middleton. 2289, 2397.
Thwaite. 6809–12.
Smith. 7051.
Drinkwater. 9483.
Dyer. 365, 421.
Hill. 237.

70. The question of the expense of defending a charge of adulteration by an appeal to the cow is another serious consideration which was urged by witnesses. It was pointed out that even if a person succeeded in proving his innocence he would be unable to recover his expenses, and cases in point were quoted. Dr. Dyer expressed the opinion, "If the appeal is to take place through the machinery of a police court it may inflict hardships on individuals which I do not think the law contemplates." Other of Dr. Dyer's professional brethren, however, do not share this solicitous regard for the milk vendor. Dr. Hill admitted that it might cost a person £20 or £30 to prove his innocence, and he held that it would "serve him right for not having better cows." The justification for the punishment is not apparent when it is considered that they may not be the cows of the vendor of the milk.

Lloyd. 6070.

71. It will, I think, be clear from the foregoing that to fix a standard which would render a frequent appeal to the cow necessary would inflict a great hardship upon vendors and producers. This was strongly brought home to the Committee, and was recognised, in particular, by Prof. Thorpe, who stated, "in some cases the man would suffer hardship, but then I venture to think that if anybody is to suffer hardship, rather the farmer than the whole community." The inequality of the hardship consists in the fact that in the one case an innocent person would be convicted, while in the other a smaller proportion than the average of one or other of the constituents of milk would be received by the consumer, which would not be to his material detriment, when it is remembered that 0·25 of fat represents only about one-forty-eighth part of the total solids contained in milk.

It is difficult to reconcile this view of so prominent a member of the Committee with the closing sentence of paragraph 79 of the majority Report, viz. :—"Great as are the objections to such a degradation of the standard, they would have been outweighed by the necessity of preventing the possibility of injustice to innocent men."

STANDARDS RECOMMENDED.

72. The recommendations of the majority of the witnesses took the form of a suggested standard for fat, in several cases a limit for solids not fat was also suggested and in a lesser number of cases a standard or limit for total solids without regard to the respective constituents was advocated. The enquiry, however, largely turned upon the percentage of fat, many of the witnesses tendering no evidence upon the other points. The recommendations divide themselves as regards fat into four heads, viz., those in favour of a standard below 3 per cent., those in favour of a 3 per cent. standard, those in favour of a standard higher than 3 per cent., and those that favoured a varying standard according to the season, and it will be convenient if I deal with them under those headings, leaving the question of non fatty and total solids to be dealt with separately.

A Seasonal Standard.

73. It is not necessary that I should recapitulate the evidence of witnesses to show that a considerable variation takes place in the quality of milk produced at different periods of the year. The matter has been dealt with fully and the fact sufficiently established, and is strongly emphasised in the reservation of Mr. S. W. Farmer. It is also clear that these seasonal differences must always occur and therefore in deciding what standard shall be fixed they must be taken into consideration. The exact period when the milk falls below the usual quality varies, of course, with the geographical position of the locality and as to whether the season is early or late, but it is generally agreed to be in the Spring and early Summer months when the cows are turned out to pasture, and when in the majority of cases the calving of a large portion of the cows brings about an increase in the flow of milk. The duration of this period also varies with the season but it generally extends over three or four months, and embraces the months of March, April, May, and June. A standard for the whole year fixed to meet this condition of things would leave a margin for possible adulteration when the milk is richer in quality. To avoid this it was suggested by several of the witnesses that the standard for these particular months should be lower than for the remaining period, rather than that it should be reduced for the whole year

74. Mr. Hoskins who represented the Evercreech and Mid-Somerset Dairy Farmer's Association suggested a standard of 2·75 of fat for the months of April, May, and June, and 3·0 for the remaining period of the year. Mr. Richmond, the accomplished Analyst of the Aylesbury Dairy Company, suggested three standards, namely:—2·8 per cent. for the months of May and June, 3·25 per cent. from September to December, and 3 per cent. for the remaining six months of the year; Mr. Hoddinott, the Managing Director of the Great Western and Metropolitan Farm Dairies Company, who questioned the desirability of fixing a standard at all, suggested as an alternative a standard of 2·75 for the four months of March to June, and 3·0 per cent. for the remainder of the year. Dr. Chalmers, the Medical Officer of Health for Glasgow, favoured 3·0 for nine months of the year, and suggested 3·25 for the months of November to January. Mr. Adams who farms largely in Berkshire adopted the same figures, but preferred that the lower limit should apply only to the four months March—June, and the higher limit during the other eight months.

75. It was suggested by some witnesses that there would be a difficulty in administering varying standards, but no indication was given as to the nature of that difficulty and how it would arise. On the contrary, Mr. Richmond was distinctly of opinion that no confusion would result even from the fixing of standards changing four times a year, such as he suggested, and he mentioned the precedent of the Metropolitan Gas Act, under which the "gas referees have power to alter the standard for sulphur in gas; and they do that, and the standard varies according to the season of the year." That it was desirable to vary the standard if practicable was the view of Mr. Fisher, the President of the Society of Public Analysts. His society had not taken into consideration the possibility of varying the standard from season to season; "but," he added, "individuals have, *and they have been compelled to do so.*" Richmond. 8605. Fisher. 3802, 4103–4.

Recommendations below 3·0 *per cent.*

76. In addition to the three witnesses, viz., Messrs. Hoskins, Hoddinott, and Richmond, referred to in the previous paragraph, who recommended that the standard for a portion of the year should be 2·75 and 2·8 respectively, several witnesses advocated the fixing of limits below 3·0 per cent. Mr. Charles Marshall, a dairy farmer of many years' experience, who represented the Northumberland Dairy Farmers' Association, was doubtful as to the wisdom of fixing a standard, but if one were fixed he "certainly would Marshall. 2264–5.

Beecroft. 813–4.
Smith. 7024.
Ashcroft. 7550.
Curtis Hayward. 4155–6.
Finney. 3289.

not go above 2·75." Mr. Joseph Beecroft, a producer of milk, cheese, and butter of great experience, who represented the Cheshire Milk Producers', Association, a society of 800 members, producing milk for sale very largely pointed out that in sixteen towns the present standard adopted varied from 2·5 to 2·75, and he considered that the latter figure was quite high enough, and that a higher standard would not be fair to many farmers. Another dairy farmer who represented the East Suffolk Chamber of Agriculture and also the Eastern Counties Dairy Institute—Mr. J. A. Smith—considered that 2·8 per cent. would be "quite high enough to be fair and just." Mr. W. Ashcroft, who appeared as the representative of the British Dairy Farmers' Association, and who in that capacity made no recommendation, gave it as his opinion, from a producer's point of view, that it would not be wise to fix a higher standard than 2·75. Colonel Curtis Hayward adopted a similar attitude as the representative of the Royal Agricultural Society, and stated from his experience of actual tests that it would "jeopardise a very large industry" if a standard of 3 per cent. were fixed. Another dairy farmer, Mr. R. Finney, who represented the Derbyshire Dairy Farmers' Association, one of the largest societies of its kind in the Kingdom, said that the farmers thought it would be a risky thing to fix a standard by law. While not making any specific recommendation, he thought "it would not be safe to fix a limit of 3 per cent. of butter fat."

Drinkwater. 9121, 9265.
Stirling, 1970.
Kennedy. 1993.
Carruthers. 2662, 2666.
Pocock. 1287.
De Hailes. 662.
Thwaite. 6890.

77. The representatives of the wholesale and retail dairy trades of London, Edinburgh, Glasgow, Liverpool, and other large towns were practically unanimous in recommending a standard of 2·75 to cover the inevitable variations in the milk as produced, and the changes in composition during distribution. Dr. Drinkwater, representing the Edinburgh and District Dairy Association, said that the majority were of opinion that 2·75 would be a fair standard; some advocated 2·55, and others were against a standard being fixed at all. Mr. James Stirling, as the representative of the Glasgow Dairy Company, recommended 2·75 per cent. as "a fair and reasonable limit," and the same view was held by Mr. Hugh Kennedy, the President of the Glasgow Dairymen's Association. Mr. H. Carruthers, representing the Liverpool and District Dairymen's Association, and speaking from an experience of forty years, stated that "it would hardly be fair to suggest having the standard that is to cover all the eventualities for the year higher than the 2·75." The same view was expressed by resolution of the Liverpool Cowkeepers' Association, and the witness informed the committee that it was the opinion of the St. Helen's and Birkenhead Association. Mr. S. J. Pocock, a large wholesale dairyman of London, was not favourable to any standard being fixed, but if one were necessary he expressed the opinion, "I do not think there would be justice done if a standard above 2·75 . . . . were fixed." The trade societies of the metropolis were represented by Mr. A. J. de Hailes, the analyst to the Dairy Trade Protection Society, and Mr. C. F. Thwaite, the delegate of the Metropolitan Dairymen's Society. Although these gentlemen were opposed to the fixing of a standard by law, it is clear that their objections arose more from the fear of the prosecution and conviction of innocent persons than from any other consideration. Mr. de Hailes stated, "3 per cent. is too high," and Mr. Thwaite referred to the possibility of innocent men being wrongly punished for selling genuine milk which might contain less than 3 per cent. of fat.

Lloyd. 6031, 6038.

78. Mr. F. J. Lloyd, who, from his position as analytical chemist to the British Dairy Farmers' Association and the Metropolitan Dairymen's Society, and having carried out important dairy research work for the Bath and West and Southern Counties Society, was enabled to speak with much authority on the subject of milk, said that there was "no doubt that a great quantity of milk which is naturally genuine milk does fall below 3 per cent. of fat," and gave as the minimal limit at which prosecutions should result the figure 2·7 per cent.

Carrick. 1006. 981.

79. It may also be mentioned that Mr. Carrick, of Carrick's Cumberland

Dairy Company, although recommending 3·0 per cent., said that he would hardly say that was a safe limit unless *direct evidence of adulteration could be obtained*, but that 2·75 was the lowest to which he would go.

Recommendations of 3 per cent.

80. A large number of witnesses advocated, either on their own behalf or on behalf of societies they represented, a standard of 3·0 per cent.

81. Five of these, viz., Dr. Chalmers, Mr. George Adams, Mr. Hoskins, Mr. Hoddinott, and Mr. Richmond have already been referred to as having recommended this standard for a portion of the year only.

82. The producers included Mr. J. Drysdale, who represented the Drysdale. 4293.
Scottish Chamber of Agriculture; Mr. T. H. Pearce, representing the Pearce. 5079.
Gloucester, Somerset, and Bristol Dairy Farmer's Society; Mr. Primrose
McConnell, representing the Central Association of Dairy Farmers; Mr. McConnell. 3057.
Christopher Middleton, representing the Central Chamber of Agriculture; Middleton. 2291.
Professor Long, who appeared as an independent witness; Mr. J. Speir, Long. 8092.
representing the Highland and Agricultural Society of Scotland; Mr. W. H. Speir. 2700.
Ralston, representing the Wigtownshire Dairy and Dairy Farmers' Associa- Ralston. 5652.
tions; and Mr. Steel, representing the Eastern Counties Dairy Farmers' Steel. 6272.
Association. The three latter, though advocating 3 per cent. on behalf of
their societies, expressed a personal preference for 3·25.

83. The analysts included Mr. George Lewin, the Superintending
Analyst at Somerset House; Dr. Bernard Dyer, Public Analyst for the Lewin. 10685.
Counties of Leicester, Rutland, Wilts, and the City of Truro; Dr. A. Ashby, Dyer. 346.
Medical Officer of Health and Public Analyst for Reading; Mr. J. Falconer Ashby. 1436.
King, Public Analyst for Edinburgh, etc.; Mr. G. D. Macdougald, Public
Analyst for Dundee; Sir Charles Cameron, Medical Officer and Public King. 5608.
Analyst for Dublin; Mr. W. W. Fisher, the President of the Society of Macdougald. 5068–9.
Public Analysts; Mr, C. E. Cassal, Public Analyst for Kennington; and Cameron. 2417.
Mr. A. H. Allen, Public Analyst for Sheffield. The two latter were disposed Fisher. 3768. Cassal. 9026.
to personally recommend 3·25 as a standard, Mr. Allen taking 3·0 as a Alllen. 4509.
working limit.

84. Two of the witnesses advocating this standard were the Medical Niven. 9070.
Officers for Glasgow and Manchester respectively, and two dairy factories Chalmers. 3461.
were represented by Mr. A. Gates and Mr. C. Prideaux. Mr. W. Bowler, Gates. 1177.
representing the Manchester and Salford Milk Dealers' Association, Prideaux. 7340.
advocated a standard of 2·75 per cent., but as this figure was based upon Bowler. 3315.
the "Wanklyn" process of analysis, it was equivalent to a standard of 3
per cent. according to the later methods.

Recommendations above 3·0 per cent.

85. Apart from those witnesses who advocated 3·25 per cent. as the
standard for a portion of the year only, and those who expressed a personal
preference for this limit although authorised to recommend 3·0 per cent.,
there were very few who were in favour of a standard higher than 3·0 per
cent. Mr. N. Story Maskelyne was one who recommended that the limit Story Maskelyne. 9972.
should be 3·25. Mr. J. Stratton, a dairy farmer of Hampshire, owning 200 Stratton. 6496.
cows, favoured the same percentage, and Mr. Bevan represented the views of Bevan. 8917.
the minority of the Society of Public Analysts in also advocating 3·25. The
only witness who suggested a higher standard than 3·25 was Dr. Hill, the Hill. 19, 40.
Public Analyst for Birmingham, and in his case the percentage recommended
was 3·5.

86. The following table will be of assistance in conveying more readily an idea of the recommendations of the various witnesses :—

Table showing Standards recommended by Witnesses (or Alternative Suggestions to no Fixed Standard).

Under 3 per cent.		3 per cent.		Over 3 per cent.	
Marshall	2·8	Drysdae	3·0	Story-Maskelyne	3·25
Beecroft	2·75	Pearce	3·0	Bevan	3·25
Drinkwater	2·75	McConnell	3·0	Stratton	3·25
Stirling	2·75	Middleton	3·0	*Richmond*	3·25
Kennedy	2·75	Long	3·0	*Chalmers*	3·25
Carruthers	2·75	*Speir	3·0	*Adams*	3·25
Smith	2·8	*Ralston	3·0		
*Lloyd	2·7	*Steel	3·0	Hill	3·5
Pocock	2·75	Lewin	3·0		
Ashcroft	2·75	Dyer	3·0		
†Bowler	2·75	Ashby	3·0		
Hoskins	2·75	King	3·0		
Hoddinott	2·75	Macdougald	3·0		
Richmond	2·8	Cameron	3·0		
		Fisher	3·0		
No Specific Recommendation.		*Cassal	3·0		
Thwaite		*Allen	3·0		
Finney		Niven	3·0		
Curtis Hayward		Gates	3·0		
		Prideaux	3·0		
		†Carrick	3·0		
		Chalmers	3·0		
		Adams	3·0		
		Hoskins	3·0		
		Hoddinott	3·0		
		Richmond	3·0		
* Limit. † Wanklyn process equivalent to 3 per cent.		* Personal Preference for 3·25. † Limit, 2·75.		*Italics* signify seasonal standard.	

Mr. F. E. Walker suggested three grades, viz., 2.4 per cent., 3·4 per cent., and 4·4 per cent.

Mr. Grigg, of the Sanitary Inspectors' Association, and Mr. Lehmann, of the Condensed Milk Manufacturers' Association, offered no evidence on the question of a standard for fresh milk.

"STANDARDS" IN FOREIGN COUNTRIES.

Appx. xxxiv.

87. Information was obtained, through the courtesy of the Foreign Office, as to the standards recognised in Belgium, France, Denmark, Holland, and Germany, and particulars were also received from the Board of Agriculture relating to the standards in force in the United States of America.

88. In Belgium a "standard" has been agreed upon which recognises as "normal" milk containing 2·8 of fat and 11·5 of total solids.

In Denmark there is no "State law," but in Copenhagen and other towns the standard adopted is 2·5 ; but in the case of milk falling below this the vendor is not punished if he can show that the milk came direct from the cow and was not adulterated.

In France no legal standard exists, but in a report of the Hygiene Committee the composition of cow's milk is recognised as being at its minimum 11·5 of total solids and 2·7 to 3·0 of milk fat.

In Sweden no "standard" is in force.

In the Netherlands there is no legal standard, but in Rotterdam a regular official control is exercised, and milk is considered abnormal which contains less than 11·0 of total solids and 2·5 per cent. of fat.

In Germany there is no imperial milk law as "it would not have been possible to frame uniform regulations for the whole Empire without injury to the producer." In Prussia there are stringent regulations in force, and a percentage of fat of 2·7 is recognised as a minimum.

89. In the United States standards are in force in twenty-one States. In Massachusetts, Ohio, and Vermont seasonal standards have been adopted, in the first-named the lower limit being applied to the months April to September, and in the two latter to May and June in each case. The limit for fat is given in seventeen cases; in thirteen States the percentage is 3·0—in one case the seasonal limit of 3·7 being also adopted—in 3 it is 3·5, and in 1 it is 2·5. Appx. xxvii.

90. Although, as pointed out by my colleagues, the conditions applicable to foreign countries may not be the same as those in this country, it is nevertheless of interest to note that in the countries of Europe, which are our neighbours, and which in most cases enjoy a similar climate, the limit in every instance is lower than 3 per cent. In the United States the conditions are widely different as regards climate, breed, and foods, and the variations of the standards being so great among the States themselves, it is obviously impossible to draw any comparison between the two countries.

THE STATUTORY LIMIT.

91. In recommending what regulations should be made by the Board of Agriculture to determine whether or not milk shall be presumed to be adulterated it appears to me that the most important considerations to be borne in mind are :—

(*a*.) To fix a standard that shall, by a firm and uniform administration of the law of the country, ensure as far as possible the supply of genuine milk.

(*b*) To prevent the odium arising from a presumption being raised that farmers and dairymen have adulterated milk which is the natural and genuine product of the cow kept under natural conditions by ordinary farmers.

(*c*.) Not to unnecessarily harass the farming or trading interests involved.

(*d*.) Not to lessen the number of those honestly engaged in the industry by imposing conditions which they cannot fulfil, or to drive men who have regard for their reputations from its ranks.

(*e*.) Not to exclude the yield of a particular breed, and certainly not that of the breed of the country.

(*f*.) Not to fix statutory limits which would raise a presumption that genuine milk of the morning yield is adulterated.

(*g*.) To allow for seasonal variations.

(*h*.) To have regard to the *present* dairying conditions of the country.

92. In the words of Dr. Ashby, "Any milk standard that may be decided upon must not be such as would be reasonably liable to condemn milk which, although not very rich, is undoubtedly genuine." The President of the Society of Public Analysts further laid down the principle of "a limit . . . . which would not rule out any particular breed of cows . . . or bring milk under suspicion which might be drawn at different periods of lactation." Ashby. 1436. Fisher. 3768.

93. It is not necessary for me to discuss at length the recommendation of 3·5 per cent. of fat. The fact that this proposal was not supported by any other witness is sufficient to demonstrate the extreme character of Dr. Hill's views, especially when it is seen that from the tables he put in—upon which he based his figures—no less than 24·3 per cent. of the samples fell below this figure, although of the afternoon milking.

The 3·25 Limit.

Ralston. 5909.
Story-Maskelyne. 9991.
Speir. 2701.
Steel. 6274.
Long. 8226.

94. The recommendation of 3·25 per cent. is important, seeing that this is the "minimal limit" adopted by my colleagues where the total solids are less than 12 per cent. It is significant that several of those who favoured that limit were agreed that under present conditions this percentage could not be reached throughout the country. Mr. Ralston said that "farmers should be educated up to that." Mr. Story-Maskelyne agreed that notice would have to be given to enable farmers to work up to the standard. Mr. Speir would make allowance for owners of small herds. Mr. Steel suggested calving all the year round as a necessary condition. Mr. Long stated that regular hours of milking would be necessary.

Story-Maskelyne. 10134, 10160.
Stratton. 6493.
Fisher. 3768.

95. Of the three witnesses who independently advocated this standard, Mr. Story-Maskelyne admitted that to reach this percentage it had been necessary to eliminate one-sixth of his herd. He further stated, "I know of cases in which there is long drought or a long spell of wet in spring . . . . and I should tell the inspector to be cautious to send up only flagrant cases . . . . and let slide those that were very near the standard." Mr. Stratton stated that he had not even had his milk analysed, and what a high standard was he hardly knew. He said, "I should fancy it should be something like 3·20, but I do not feel inclined to dogmatise upon that." Mr. Bevan represented the minority of the Society of Public Analysts, the majority being represented by the President, who expressed the opinion that "the only reasonable and safe course we could adopt was to maintain the old limit of 3·0 per cent of fat."

96. In view of the undue weight which has been given by my colleagues in Paragraphs 71 and 72 of their Report to the evidence of the analytical witnesses, it must be recognised that several of those who are quoted in support of their arguments did not really recommend a standard of 3·25.

See Questions 2436, 2441.
Macdougald, 5068-9, 4965-6.

Mr. Macdougald, whose analytical methods were discredited by certain members of the Committee but whose figures have now been utilised by them, recommended 3·0 of fat as being "a fair and safe figure to take." He also stated that a change to 3·25 "would be rather violent."

King. 5608.

Mr. Falconer King stated, "I think 3 per cent. of fat is a very fair standard, and I would be quite satisfied with it."

Lloyd. 6031.

Mr. F. J. Lloyd pointed out, "If a standard of 3·25 per cent. of fat were taken we should condemn as adulterated about one-fourth of the milk now sold in London as judged by the samples coming to me."

Dyer. 365, 408. 363.

Dr. Dyer expressed it as his "personal view that . . . . we should be content to take the moderate figures which have hitherto prevailed," and "a great deal of friction and trouble would be caused by the 3·25 limit." "The fixing of a higher standard than 8·5 and 3·0 would from time to time lead to the undue vexation of even the keepers of large herds of good cows . . . . and it would be still more likely to press hardly on those who had few animals."

Ashby. 1436.

Dr. Ashby was of opinion that the 3·0 standard was "perfectly fair and reasonable."

Cameron. 2582.

Sir Charles Cameron was of opinion that 3·25 per cent. would be going "dangerously near" to the average.

Richmond. 8370.

Mr. Richmond, representing the Aylesbury Dairy Company, whose contracts with farmers stipulate for 3·25 per cent. of butter fat, stated, "In the months of May and June we have a large number of the farmers supplying milk which falls below that; for instance I may say that about one half the samples of morning milk examined yesterday (May 8th) were below the contract quality." He, himself, recommended a standard of 2·8 for the two months mentioned.

97. It is evident from the foregoing that the balance of the analytical evidence was very largely in favour of a standard of less than 3·25, and certainly the fact of the very few witnesses outside the analytical profession who recommended that standard would not be a sufficient justification for its adoption.

98. In view of the contention of the majority of my colleagues (see par.

82 of their Report) that "in the cases where, in perfectly genuine milk, the fat falls somewhat below this limit (3·25) it almost invariably happens that the deficiency in the amount of fat is counterbalanced, or more than counterbalanced, by an increase in the amount of the solids not fat," bringing up the total solids to 12, a reference to the tables handed in by witnesses will be of interest.

99. From the table presented by Mr. Lewin, of the Government Laboratory, where the samples were taken from individual cows, and the composition of the milk both in fat and solids not fat is given, it will be seen that of forty-one cases where the milk fell below 3·25 per cent., in twenty-five instances, or 61 per cent. of the cases, the total solids also fell below 12 per cent., and in three cases of the mixed milk of dairies the total solids were less than 12 per cent. in each instance. Of six of the samples quoted by Dr. Ashby as being below 3·25, five were also below 12 per cent. The five samples referred to by Dr. Chalmers in his first table that were below 3·25 per cent all contained less than 12 per cent. of total solids. Of the 165 in the second table 127 (or 77 per cent.) were below 12 per cent. In the case of Mr. Knight's table, handed in by myself, eighteen samples out of thirty-one (or 58 per cent.) that were below 3·25 also failed to reach a total of twelve. The figures given by Mr. Stirling showed that of eleven samples containing less than 3·25 per cent. of fat there were four (or 36 per cent.) that did not reach a total of 12·0. The last-mentioned, it may be stated, were taken in September and October, two of the best months of the year. It will be seen from these figures that in the bulk of cases where the fat falls below 3·25 the total solids also fail to reach 12 per cent.

Appx. xxvii. B.
Appx. xxvii. C.
Appx. vi.
Appx. x.
Appx. xi.
Appx. xxxii.
Appx. vii.

100. Several of the tables are of very little value as a guide to what the "minimal limits" should be. In some cases they give the *average* of the two milkings of the day, in others the *average* of the week, or the month, or the year, and in others the *average* of the afternoon milking only, while in some the *average* is taken for the most favourable period of the year. Several of the tables give the fat percentage only.

101. In the case of the table handed in by Mr. Ralston the figures represent the monthly *average* of the mixed milk of the morning and evening meals, and accepting the very low figures acknowledged by my colleagues as the difference in fat between the two yields, viz., 0·5, and deducting one-half, viz., 0·25, to arrive at the figure for the morning yield, it will be seen that during the months of March, April, May, and June the *average* of the morning milk in every one of the eight years was below 3·25.

Appx. xiii.

102. The table furnished by Mr. Lloyd showing the *average* composition of "genuine milk" received from the members of the Metropolitan Dairyman's Association, affords no guide to arriving at the actual composition of the samples, seeing that the figures represent the *average* of a month and include both morning and evening milk, the proportion of samples of which is not known.

Appx. xiv.

The second table presented by Mr. Lloyd shows the *average* of the herd, the *average* of the two meals, and the *average* of the month, the figures covering the seven months from April to October. Although from the best dairy county in England, viz., Somerset, it will be seen that after deducting 0·25 to allow for the difference in the two meals the percentage of fat would *average* less than 3·25 in the morning for five months in each of two years, four months in another, and one month in another.

Appx. xv.

103. The tables handed in by Mr. Walker giving the summaries of milk tests at the Escrick Park Dairy showed that of a total of 522,587 gallons, 166,851 gallons—or nearly a third of the whole—did not exceed 3·2 per cent. of fat. In this case the total solids are not given, but if the percentage below 12·0 arrived at from the figures of the Somerset House tests are taken, viz., 61 per cent. (see par. 99), it will be seen that 101,779 gallons would be presumed to be adulterated under the standard recommended in the majority report. Out of the 15 dairies supplying the Escrick Park Dairy from April 17th to 20th, 1900, ten supplied milk on one or more days containing less than 3·25 of fat, and on one occasion over 52 per cent. of the whole supplies were below 3·25.

Appx. xix.

Appx. xxiii. 104. The tables handed in by Mr. Bevan are representative ones, seeing that they refer to the months of May and June. From these it will be seen that in 1896, the number of samples tested ("excluding watered samples") that failed to reach 3·25 per cent. was 34·17 per cent. of the whole, in 1897 it was 45·44 per cent., in 1898 it was 33·68 per cent., and in 1899 it was 26·45 per cent. In this case also no total solids are recorded.

Appx. xxiv. 105. From the tables showing the composition of the milk sent out by the Aylesbury Dairy Company it will be seen that the number of days on which milk was sent out containing less than 3·25 of fat was: in 1894 39 days, in 1895 30 days, in 1896 24 days, in 1897 41 days, in 1898 28 days, and in 1899 69 days. Of these 231 days 177 (or 76·5 per cent.) were in the months of May, June, and July, viz., in May 71 days, in June 79 days, in July 27 days. Each of the samples represented samples from 10 to 20 churns, and the number of similar samples, or those approximating thereto, on each day is not stated, nor are the total solids given.

Appx. xxx 106. The table handed in by Mr. Cowan shows the results of tests of mixed samples of morning and evening milk supplied to the Galloway Creamery for twelve months by thirty-four dairies. After deducting 0·25 from the fat solids (the total solids not being given) it will be found that in 502 instances the fat in the morning milk was below 3·25. The number of analyses made was 1,472, thus showing that 34·1 per cent. of the samples taken over the whole year contained less than 3·25 per cent. of fat in the morning, although each analysis was the *average* of a week's samples.

107. If 1·0 per cent. is taken as the difference between the two meals as stated in the evidence referred to in paragraph 16 and 0·5 is taken off the average to arrive at the morning percentage it will be seen that in all the instances mentioned above the fat in the morning milk would have been below 3·0 per cent.

The Governing Limit of 12·0 *per cent.*

108. Several important witnesses expressed their dissent from the view that a safeguard would be provided by fixing as a governing limit the total of
Lloyd. 6031. 12 per cent. of solids. Mr. Lloyd was distinctly of opinion that 12 per cent. of total solids, with even 3 per cent. of fat, instead of 3·25, would be very difficult to obtain with the morning milk where the intervals of milking were uneven.
Dyer. 403, 413, 417. This limit also met with the strong disapproval of Dr. Dyer, Mr. Middleton,
Middleton. 2276. and Mr. Pearce, whilst Mr. Falconer King stated that he would not recom-
Pearce. 5165. mend a prosecution or certify milk to be adulterated if the total solids were
King. 5612. 11·50. Although the majority of the Central Chamber of Agriculture recommended 12 per cent. of total solids with 3 per cent. of fat, it was stated by Mr. Middleton that a considerable minority were in favour of the
Lewin. 10685. total being fixed at 11·5. Mr. George Lewin, of the Government Laboratory, expressed the opinion that the total solids should be 11·75 of which 3·0 per cent. should be fat.

Mr. Bowler, the representative of the dairymen of Manchester,
Bowler. 3317. which is the model city where less adulteration prevails than in any other, recommended 11·5 as the standard for total solids.

109. An examination of those tables in which the percentage of
Appx. iv. both fat and other solids is given, will show the extent to which
Dyer. 463-6. samples of admittedly genuine milk would be condemned under the governing limit of 12 per cent. In the case of the analyses referred to by Dr. Dyer 517 samples were passed by him as genuine. Of these 66 were below 12 per cent. in total solids, and of the 66, 46 were also below 3·25 per cent. in fat. The samples were taken in the months of September to March—the most favourable period of the year—from the rich milking counties of Leicestershire, Rutlandshire, and Wiltshire. Under the suggested limits it would appear that 9 per cent. of these samples which had been passed as genuine would have to be condemned as adulterated.

Appx. vi. 110. Dr. Ashby handed in a table showing that of twenty-five samples of farmers' milk collected between February 14th and March 5th five, or 20 per cent., were below 3·25 per cent. of fat and 12·0 per cent. total solids; four of these were morning's milk out of a total of eleven.

111. Dr. Chalmers showed the result of the analysis of a similar number of farmers' milks. In this case six were less than 12 per cent. in total solids and five of these, or 20 per cent., were below 3·25 in fat also. Another table showed that of 280 samples which were passed as genuine or "too narrow for prosecution" no less than 127, or 45 per cent., failed to reach 12 per cent. of total solids and were also below 3·25 per cent. of fat.

Appx. x.

112. Table B, handed in by Mr. Lewin, gave the result of tests of individual cows. Of sixty Shorthorn cows, all the samples from which, with one exception, were taken in February, the morning milk fell below 12·0 and also 3·25 per cent. on ten occasions.

Appx. xxvii.

113. From the table handed in by myself showing samples taken on behalf of Mr. John Knight of Stepney on the arrival of the milk at the railway station in the months of May and June, it appeared that seventeen out of thirty-eight samples, or 45 per cent., fell below both of the above limits. Mr. Knight had no doubt of the genuineness of the milk, and all of the dairies had been sending 4 per cent. of fat before grass time.

Appx. xxxii.

114. Numerous instances of a similar nature were quoted in their evidence by Mr. Pocock, Mr. Marshall, Mr. Ashcroft, and Colonel Curtis Hayward and others.

Pocock. 1257.
Marshall. 2188.
Ashcroft. 7486.
Curtis Hayward, 4132-3.

The 3 *Per Cent. Limit.*

115. It is impossible to escape the conclusion that the great preponderance of opinion was in favour of a standard of 3·0 per cent., and that, so far, at any rate, as a portion of the year is concerned there were substantial reasons adduced for the standard being fixed at that figure. It was not, however, claimed that genuine milk even when the mixed product of several cows did not at times fall below that point, and the recommendation of such a limit, notwithstanding that fact, was in several cases only made on the assumption that *before any prosecution* the vendor would have an opportunity of explaining any alleged deficiency. Frequent reference was made to the Aylesbury Dairy Company, whose contracts with farmers stipulate for a percentage of butter fat of 3·25 per cent. From the table handed in by Mr. Richmond it will be seen, particularly in the years 1897-1899, that on several occasions milk was sent out by the company in the months of May and June containing 3 per cent. of fat or less, while frequently the border line was dangerously approached. In June, 1899, for example, milk was sent out on nineteen days which did not exceed in fat 3·1 per cent. As every sample tested represented the mixed milk of ten to twenty churns it will be seen that even if there was only one such sample on each day—which does not necessarily follow—the quantity sent out of this milk during that month would be from 200 to 400 churns.

Appx. xxiv.

116. A member of this Committee—Mr. Farmer—who supplies milk to the above company, handed in several tables showing the composition of the morning and evening's milk sent from the various farms in his occupation. From these it will be seen that from farm No. 1 milk was sent on some occasions during four months of the year with a percentage of fat lower than 3 per cent. Farm No. 2 fell below 3 per cent. at times in each of six months of the year; farm No. 3 was deficient in two of the months; farm No. 5 in six, farm No. 6 in three, farm No. 7 in five, and farm No. 8 in six.

Appx. xxxv.

Mr. Farmer pointed out that these farms were adapted for winter dairying, and that a large proportion of the cows were in an advanced stage of lactation during the spring and summer months, the milk being therefore of a higher quality at that period than is usual at the majority of farms throughout the country during those months.

117. It will therefore be seen that not only does milk, produced under

the most favourable conditions, fall below 3 per cent. even when mixed, but that large quantities are retailed by firms of high repute at or below that figure.

118. There was much evidence to show that the quantity of such milk
Lloyd. 6038. produced is very considerable at some periods. Mr. Lloyd stated : "There
is no doubt that a *great quantity* of milk which is natural genuine milk does
Hoddinott. 7672, 7733. fall below 3 per cent. of fat." Mr. Hoddinott gave it as his experience that
during the months of March, April, May, and June 30 per cent. of the milks
received by the Great Western and Metropolitan Dairies Company fell
below 3 per cent. of fat at some time or another, and of this one-third,
or 10 per cent. of the whole of the supplies, were found wanting every day.
Stirling. 1804, 1818. Mr. Stirling gave an instance of samples being taken from 30 representative
herds round Glasgow which, although of the afternoon milking and taken in
September and October, showed that the mixed milk of the herds in 9 cases
contained less than 3·0 per cent of fat. He also quoted the case of milk
received from a dairy institute which on being tested by the Professor
himself gave an average of 2·9.

Ashcroft. 7507. 119. Mr. Ashcroft quoted cases of milk being supplied to the Bath and West Dairy School, which on 7 days out of 22 in the month of April and 9 days in the month of May, fell below 3 per cent., and in the case of a different farm the same condition of things arose on 4 days in the month of April and 6 days in the month of May.

Curtis Hayward. 4128, 4132. 120. Colonel Curtis Hayward gave examples of milk supplied to the County Dairy School of Gloucester. The result of two tests taken in April showed that the morning milk on each occasion was 2·8 per cent., although the evening milk showed 4·6 and 4·9 of fat respectively. In May there were four occasions when the percentage in the morning fell below 3 per cent., and the average for the whole month was exactly 3 per cent., the evening average being 4·5. In June, although the percentage fell below 3 on only one occasion, on seven days it only just reached that figure.

Marshall. 2222-4. 121. It is also clear that in cases such as those quoted by Mr. Marshall
Middleton. 2281. and Mr. Middleton, where the milking takes place at intervals of eight and
McConnell. 3070, 3173-4. sixteen hours (see paragraph 15), a considerable quantity of genuine milk
would be condemned under a 3 per cent. standard, and this view is confirmed
by the evidence of Mr. McConnell and others.

122. Innumerable instances could be given where the percentage barely reaches the border line, in Mr. McConnell's own case no less than 20 per cent. of the samples quoted coming within a decimal point of 3 per cent., although he expressly stated that he never used either mangolds or brewers' grains as a feed for his cows.

123. Whilst giving due weight to the evidence of individual witnesses it cannot be overlooked that still greater importance attaches to the recommendations of the many important agricultural and other associations that were invited by the Committee to send representatives to express their views, having regard to the large number of members and the *considerable* interests which they represented.

124. The following is a list of those Associations who recommended a standard of 2·75 per cent. :—

The Glasgow Dairymen's Society.
The Edinburgh and District Dairymen's Society.
The Liverpool and District Dairymen's Society.
The Cheshire Milk Producers' Association.
The East Suffolk Chamber of Agriculture.
The Evercreech and Mid Somerset Dairy Farmers' Association.

125. The Associations recommending a standard of 3 per cent. were as follows :—

The Manchester and Salford Dairymen's Association.
The Central Association of Dairy Farmers.

The Gloucester, Somerset, and Bristol Dairy Farmers' Association.
The Wigtownshire Dairy and Dairy Farmers' Association.
The Eastern Counties Dairy Farmers' Association.
The Central Chamber of Agriculture.
The Scottish Chamber of Agriculture.
The Highland and Agricultural Society.
The Society of Public Analysts.
The Association of Municipal Corporations.
The Association of Medical Officers of Health.

126. Those recommending a standard of 3·25 were conspicuous by their absence—unless the minority of the Society of Public Analysts be mentioned as the exception.

127. There were six societies that recommended that no legal standard should be fixed or made no recommendation at all. In all these cases the witnesses by whom they were represented declared their opinion that 3 per cent. was too high and in some instances specifically recommended 2·75 per cent. They were as follows:—

The Royal Agricultural Society of England.
The British Dairy Farmers' Association.
The Northumberland and Durham Dairy Farmers' Association.
The Derbyshire Dairy Farmers' Association.
The Metropolitan Dairymen's Society.
The Dairy Trade Protection Society.

Effect of High Limit on Small Holdings.

128. The effect of the imposition of a high minimal limit which would preclude the sale of milk by owners of small herds, is a matter for serious consideration. It was generally admitted that the difficulty in maintaining anything like a uniform quality of milk throughout the year was much greater in the case of a person owning a few cows than in that of owners of large herds. It is clearly in the interests of agriculture that the development of small holdings should not be discouraged, and that being so it is essential that no regulations should be made that would impose disabilities upon the holders that would not apply to large owners. This point was strongly laid before the Committee by Colonel Curtis Hayward, who in referring to a 3 Curtis Hayward. 4140. per cent. limit said, "You will deprive all these small men who own perhaps a couple of cows, from selling their milk for the first two months after their cow calves, because I do not believe the average cow that the small dairyman has will give for two months after calving 3 per cent. of butter fat in the morning whatever it may do in the evening." The witness spoke from his own knowledge of the large number of such small holdings, where the produce of the cows was sold to neighbours. Dr. Dyer also Dyer. 346. referred to the fact of the milk of a few cows being "very frequently" retailed, chiefly in the country districts. Mr. Middleton spoke of the "very Middleton. 2387. great number of producers who have only four or five cows." Mr. Stirling Stirling. 1947-8. referred to the "great number" in Scotland of such farmers, and Sir Cameron. 2417. Charles Cameron spoke to the same effect as to Ireland.

THE STANDARD RECOMMENDED.

129. In view of the foregoing considerations I can come to no other conclusion than that a seasonal standard should be adopted.

130. By fixing that standard at 11·75 of total solids with the stipulation that during the months of July to February any milk that falls below that total and which at the same time contains less than 3 per cent. of fat, and any milk which during the months of March to June shall fall below that total and at the same time contain less than 2·75 per cent. of fat, shall be presumed to be adultered until the contrary is proved, I am convinced that the consumers would be adequately protected, and although there would still be cases where the sale of the genuine product of the cow would render men liable to the "presumption," and in many cases conviction, it must be

obvious that those cases and the friction arising therefrom would not be one-fourth of those likely to arise from the fixing of the "minimal limits" suggested by my colleagues.

131. With regard to the solids not fat I am in accord with the views of my colleagues, and am of opinion that where the percentage falls below 8·5—the total solids being less than 11·75 per cent.—a presumption shall be raised that the milk is adulterated. In cases where the non-fatty solids in genuine milk falls below 8·5 the fat is usually high, and such cases would be met by the analyst taking into account the extent to which the butter fat exceeds the limits above mentioned.

132. I am considerably strengthened in my conclusions by the view expressed in a letter addressed to me by Dr. Vieth, who was formerly analyst to the Aylesbury Dairy Company, and who was quoted by several analytical witnesses as an authority of great weight. In his letter, which was read to the Committee, he stated, "I would not advise to prosecute unless the fat falls below 2·75 and the solids not fat below 8·25." Few persons have had greater experience in the analysis of milk than this gentleman, and holding as he now does an independent position in a foreign country, namely, as head of the Dairy Institute at Hameln, Germany, there can be no question whatever as to his opinion being unbiassed and his attitude being one of strict impartiality.

133. In recommending the above standard I do so from the conviction that such a standard properly worked in a uniform and efficient manner throughout the country, with the sole object of putting a stop to fraud, would do infinitely more good than a higher standard worked with more or less laxity, and left to the judgment of officials and committees not to be enforced too vigorously or administered in a half-hearted way by magistrates who, after a number of cases of the "presumption" being unjustly raised, would feel that the standard was acting harshly by harassing and punishing innocent men.

134. I do not for one moment entertain the opinion that the consumer would suffer by the fixing of such a standard. Abundant evidence has been forthcoming to show that with the Somerset House limit of 2·75 (which was in operation for many years) the quality of the milk supplied to the public has been extremely good, *averaging* a much higher figure than the standard. Dyer. 422, 507-8. Dr. Dyer, whose experience with milk analysis has been very large, stated that the "average quality of milk is at present satisfactorily high," and that the limit of 2·75 has not caused farmers and dairymen to water their milk. Equally emphatic are the words of the President of the Society of Public Fisher. 3784, 3789. Analysts that cases of adulteration are "comparatively small," and that "we do not find that it is a fact that the separator, which has been used for so many years, is systematically used in the way suggested for reducing the strength of milks. . . . We find that a very small proportion of our milks come between 3 and 3·2."

135. I have no desire to "put back the clock," although even that would be necessary if it were found that the clock was going too fast. It is very important that the clock should keep correct time, and not hurry on to mark the hour of noon in advance of the sun. Neither should the "minimal limits" be advanced more rapidly than the cows can keep up with them. The standard which I propose would be an advance upon the working condition of things as they stand at present, seeing that according to the King. 5365. evidence of Mr. Falconer King it is impossible to get a conviction in Edinburgh on a sample of milk containing only 2·1 per cent. of fat, and that in some places, such as the important town of Middlesborough, the standard, as Beecroft. 887. stated by Mr. Beecroft, is 2·5 per cent. The standard I have suggested above, which all analysts would act under, and which would be accepted by magistrates throughout the country, would be more than equal to the standard adopted in many places, and would in fact be 0·25 higher for eight months of the year than that which has prevailed for many years past and

which is still largely used, viz., the Somerset House limit of 2·75, which was only recently altered. The effect of this would be that assuming a sample contained 2·5 per cent. of fat the presumption would be that it had been deprived of 17 per cent. of its fat, whereas under the 2·75 standard the estimated deficiency would have been only 9 per cent., and this I need hardly say would increase the offence in the eyes of the magistrate.

136. It must also be considered that the fact of "minimal limits" being laid down by the Board of Agriculture would cause them to be applied more rigidly than has been the case with the hitherto recognised standard. The discretion of the analyst would, in large measure, be done away with, and no allowance would be made, as is often done at present, for what is
known as "working limits." Such was the view indicated by the President Fisher. 3809.
of the Society of Public Analysts, who said that considerations which had hitherto been taken into account by the analyst would be removed from his province by the operation of the new Act, and that was "one reason why he hesitated to recommend any change of the boundary line."

137. It may here be pointed out that an increase of the 2·75 limit to 3 per cent., although apparently a small one, is equivalent to a demand for an increase of 9 per cent. in the butter fat of the milk, and that a further raising of the limit to 3·25 per cent. would be equal to demanding from the producer a further 9 per cent., making an additional 18 per cent. in all. It will therefore be seen that to increase the minimal limit to 3·25 would be a very serious matter for both producer and vendor.

138. In drawing a comparison between the value of the evidence of producers and distributors and that of the "scientific" witnesses, as my colleagues have done, I must take exception to the view that the latter are alone qualified to judge of what should be the limits that should determine the genuineness or otherwise of milk. However high they may stand in their profession, it certainly does not follow that they are conversant with all the conditions that govern the production of and the changes in the composition of an article of so variable a character as milk, or that they are acquainted with the vicissitudes that attend its distribution. It may be mentioned that one of the principal analytical witnesses confessed to his
entire ignorance of the difference between morning and evening milk, and Hill. 171-176.
also stated that the milk dipped from the top of a churn after it had been standing would not be richer in fat than if drawn from any other portion.
Another analyst thought it possible to properly sample milk from a churn Ashby. 1601.
without turning it out, a fallacy refuted by all practical men, and also stated that he did not think there would be much rising of the fat from the time the milk was put into the churn to the time it reached the point of delivery.
A medical witness admitted that he had no knowledge of the difference Chalmers. 3703-4.
between the morning and evening milk, and although he gave evidence as to the age when cows should be withdrawn from the herd, he had no personal knowledge of the subject, nor of the chief period of lactation of a cow.

Seeing that the greatest variation in milk is usually that between the morning and evening yield, it is a striking commentary on the theory that analytical witnesses are most qualified to judge as to the limits that should
be fixed, when Mr. Middleton states: "I think perhaps chemists are rather Middleton. 2299
coming round to the opinion now that there is that disparity to some extent."

139. It is certainly unjust and ungenerous to those men of integrity and standing who represented the distributors before the Committee, and who were unanimously opposed to a high standard, that it should be implied that their views were influenced by "personal interests." The evidence has shown that it is the constant endeavour of the distributors to secure the highest
quality of milk possible for the consumers, and their contracts with the Hoddinott. 7662, 7729.
farmers bear this out. They do not always get what they stipulate for, but Pocock. 1281.
it cannot be denied that they endeavour to do so. The Society represented Thwaite. 6954.
by Mr. Thwaite, viz., the Metropolitan Dairymen's Society, which is the Carruthers. 2662.

King. 5556. oldest dairymen's society in the Kingdom—has in the past largely assisted in improving the milk supply of the metropolis by maintaining its own inspector and analyst and in prosecuting known offenders.

140. I fully believe that all the witnesses that have appeared before the Committee did so with the sole desire of honestly assisting the Committee in their efforts to elucidate this difficult question, and I should not for a moment suggest that any one of them gave evidence that would serve his own personal interest, but when my colleagues endeavour to diminish the value of the evidence given by those connected with the milk industry by such references as "personal interests" as applied to them, and "the interests of truth" as applied to analysts, I cannot do otherwise than point out that if a standard of 3·25 is adopted it will make a veritable "Tom Tiddler's ground" for the members of the analytical profession, inasmuch as the public analyst for a particular district would correctly say that a presumption of adulteration had been raised by milk coming below the standard fixed as the "minimal limit" by the Board of Agriculture, while other analysts would be engaged in proving that a large portion of the morning milk and that produced in the spring months and at other times was the genuine product of the cow, notwithstanding that it contained less than the "minimal limits" laid down by the Board of Agriculture.

141. The evidence of several of the witnesses pointed to the great difficulties of keeping the composition of milk constant in the course of delivery and distribution, and the serious risks which those engaged in the industry have to constantly face from this cause alone. From my own experience of milk of the past forty years, both as producer and as a distributor—a practical experience which I think I can, in all modesty, claim to be greater than that of any other person in the industry—I can fully bear out the accuracy of the statements which have been made. The difficulty of keeping milk, one portion of the solids of which is held in solution and another in suspension, of an exact and even composition during the whole course of its sale is practically insuperable.

Marshall. 2264. As Mr. Marshall stated, "No doubt people ought to be able to mix
Ashcroft. 7551. milk up, theoretically—practically it is not possible to do it." Mr. Ashcroft
gave instances where the milk differed from 0·16 to as much as 0·45 in the
Richmond. 8666. course of retailing. Mr. Richmond pointed out that milk, although containing
3·25 of fat when sent out, would in some cases be returned as containing
only 3 per cent. upon the certificate of the Public Analyst.

Speir. 2879. 142. The question of sampling is also an important one. Mr. John
Pocock. 1269. Speir expressed the view, "A great deal depends on the taking of samples,
Thwaite. 6818, far more, I believe, than on the analysts themselves." Unless the greatest
6814. care is taken it is impossible to take a fair sample, and several of the
De Hailes. 626-630, 792. witnesses spoke as to the risk attending the taking of a sample towards the end
Stirling. 1742, of the sales, when there was very little left in the counter-pan or in the hand-
1974. can, owing to the rising of the fat globules to the surface. Mr. Speir,
Drinkwater. 9197, 9200. referring to this risk said, "I think this Committee would be quite doing
Kennedy. 1994. justice to themselves to take note of that." The fact that it has been
Carruthers. 2673. decided by law that the responsibility for selling milk which might be
Prideaux. 7435. deficient in fat from this cause rests with the vendor should be an additional
Speir. 2812. reason for not fixing the minimal limit below which a prosecution should
arise higher than is justified by the evidence.

Stirling. 1733. 143. The possibility of an error being made in the analysis was emphasised by Mr. Stirling, who gave examples of the difference in butter fat in
the analyses given by different analysts of the same milks, which amounted
Allen. 4743. to 0·21 in one series, and as much as 0·86 in another. Mr. Allen stated,
"There is a limit of error which might come to 0·1 certainly between two
Richmond. 8675. analysts," and that he had had such cases in his own laboratory. Mr.
Niven. 9766. Richmond confirmed that view, and Dr. Niven also referred to the possibility
of error in the analysis. It will therefore be seen that milk approximating
to the standard would be in danger of being condemned as adulterated in the

event of an error, such as is admitted to be possible, being made in the analysis.

144. A great deal has been said as to the raising of a presumption being a saving clause. The "presumption" is "for the purposes of the Sale of Food and Drugs Acts," and those Acts do not contemplate an intermediate tribunal or Court of First Instance, sitting in camera, between "the prosecuting agent and the Court." Therefore if the word implies anything at all it implies a prosecution commencing with the presumption that the accused was guilty, and where the origin of the milk was known, tracing it to the place of production, bringing witnesses—it may be 100 miles—at great expense, and afterwards taking expert witnesses to the cow. The cost of a few such cases would ruin many a small farmer, while it would be obviously unwise and unjust to fix a "minimal limit" that would be too high and leave the costs of the prosecution, in the event of failure, to be borne by the ratepayers. It cannot be too strongly urged that a standard which recognises in the "presumption" an adequate provision for vindicating the innocence of a person wrongly accused would operate very harshly against a large body of traders, especially those in a small way of business, who could not possibly trace the milk back to the cow, and who would not have the means to prove their case if they could. In such instances they would be compelled to pay a fine rather than face the expense of an appeal to the cows and the risk of increased punishment should that appeal be unfavourable.

145. I am fully conscious of the difficulties of the question at issue. No one has done more than myself to improve the milk supply of the metropolis, and I yield to none in the desire to protect the consumer from fraud either on the part of the farmer or the dairyman, but I cannot in the true interests of agriculture and of a great and important industry bring myself to assent to any measures that would have the effect of closing a market to farmers, through their inability to milk at equal intervals, or that would inflict hardship on small owners, or cause land to be put out of cultivation, or necessitate the reduction of the herds of the country, nor can I in the interests of traders agree to any course that would, while making so-called provision for the contrary to be proved, raise the presumption that the innocent vendor was a rogue or fraudulent trader. I have therefore felt it to be my duty, at a very considerable sacrifice of time and trouble, to embody my views in the form of a Minority Report.

SEPARATED MILK.

146. I am in accord with my colleagues in the view they express that there should be no distinction made between hand-skimmed and machine-separated milk. To fix a limit of fat for skimmed milk would, as suggested by Mr. Stirling in his *précis*, "be putting a premium on careless skimming and make carefulness a crime."

147. I am also in accord with the suggestion as to earmarking separated milk by the addition of some perfectly harmless substance which would readily reveal itself upon analysis, before its sale for consumption, so as to prevent its use for the adulteration of genuine milk. Such substance should not depreciate the milk either to the eye or to the taste, or interfere in any way with its value as an article of food. In the desire to protect the farming industry against unfair competition, it must not be forgotten that a very large number of farms are, by want of sufficient railway facilities and other reasons, compelled to sell their milk to butter and cream factories, and if anything is done to prevent separated milk from going into consumption in a legitimate manner the value of the bye products of these factories would be depreciated and the farmers supplying these factories would be unable to obtain as high a price for their produce as if the separated milk were sold to advantage.

148. I fail to see that any useful object is to be gained by fixing a high standard for separated milk, seeing that it is an article of small commercial value.

A large quantity of separated milk is used for the manufacture of biscuits, scones, &c., and the effect of enforcing a high standard under the heavy penalties of the Act would be to cause a great deal of this wholesome food to be entirely wasted in large towns, as respectable traders would be unwilling to undertake the risks attending the sale of the article under such conditions, particularly as there could not be any possible appeal to the cows, and any presumption that might be raised would mean a conviction of the vendor. In the case of butter and cream factories, all separated milk below the standard the Board of Agriculture may fix must in future be fed to pigs although it may be quite pure.

149. I therefore recommend that the limit for total solids should be 8·75. It has been proved over and over again that in cases where the milk is exceptionally rich in fatty solids, the solids not fat frequently fall below 8·5 per cent. If therefore the amount of non-fatty solids in such cases is put at 8·3, and 0·2 or 0·3 is added for the amount of butter fat that is left in the milk after efficient separation, it would bring the total to 8·5 or 8·6, so it will be seen the limit of 8·75 which I have suggested does not err on the side of being too low.

150. It must be admitted that the percentage of solids not fat in milk is slightly increased by the abstraction of the butter-fat. In the above case, assuming that the fatty solids were 3·5 per cent. and the non-fatty solids 8·3 per cent., it would follow that the percentage of the latter after the abstraction of the former would be based on the proportion of the figures 8·3 per cent. to the figure 96·5 per cent. This would give a result of 8·6 per cent. which, apart from the question of the butter-fat remaining, will bear out the reasonableness of the limit suggested.

151. It appears to me, however, that the question of how much butter-fat may be left in the milk should not be taken into consideration in fixing a standard for separated milk. The mechanical methods now in vogue in the separation of milk have attained to such efficiency, that no more than a minute quantity of butter-fat need be left in the milk. But in this respect finality may not have been reached, and it is quite within the bounds of possibility that those methods may be further improved, so that every particle of fat may be recovered from the milk. Therefore to fix a standard which would assume the presence of a certain quantity of butter-fat would, in my opinion, be unwise.

Condensed Milk.

152. The evidence received on the subject of condensed milk was confined to a few witnesses, and was mainly of a scientific character. It is to be regretted that only one witness was heard on behalf of the manufacturers of condensed milk, and that this witness was only able to speak as to condensed milk produced abroad. It would probably have assisted the Committee to have come more readily to a conclusion if they had had before them representatives of the milk-condensing industry in Great Britain and in Ireland, in the latter of which countries the industry is assuming large proportions.

153. There can be no question that condensed milk is used very largely as a food for infants and young children, and that being so, it is important that there should be some rule by which its quality can be judged. To the consumer this is a much more difficult matter than in the case of new milk, where excessive poorness is evident both to the eye and to the taste, and therefore it appears to me that there is more need of protection for the public in the case of the condensed product than there is in the case of new milk. Hence a standard by which the quality of the former can be judged is in my opinion necessary.

154. It would, however, be unwise, in my judgment, to lay down a hard and fast line by which the degree of condensation should be fixed. It is evident that such action would unduly interfere with the processes of manufacture and would seriously hamper a legitimate industry. On this point the evidence of Mr. Lehmann shows that it is impossible to guarantee the degree of condensation, and "that any analysis that is based primarily on a fixed degree of condensation—thus fixing an arbitrary degree of condensaton for milk—is impossible." Further he pointed out that the degree of condensation is varied by manufacturers according to the period of the year and the destination of the milk, and that the consistency alters according to the length of time that the milk has stood, this latter condition of things being, up to the present, incapable of satisfactory explanation.

Lewin, 10,632.
Fisher, 8,902.
Lehmann, 10,415.
10,287.
10,296.

155. It has been suggested by my colleagues that a percentage of fat of at least 10 per cent. and of other milk solids of 25 per cent. should be demanded, which would represent a condensation to about one-third of the original milk, but an examination of the table referred to and put before the Committee by Mr. Fisher, the President of the Society of Public Analysts, tends to show that the effect of this would be to place on the market milk with a lower percentage of fat than that in milk condensed to a lesser degree. For example, where the ratio of condensation is 2·6, as in the case of the Anglo-Swiss sample quoted, the percentage of fat in the original milk is given at 4·1, and where it is 2·9 the percentage of fat is 3·6. On the other hand the sample which showed a ratio of condensation of 4·0 gave a percentage of fat of 2·4, and another with a ratio of 4·4 showed 2·1 of fat. For purposes of simplification I append the figures in tabular form :

Fisher, 8,889.

Brand.	Percentage of Fat in the Original Milk.	Ratio of Condensation.
Anglo-Swiss	2·6	4·1
Swiss	2·9	3·6
Darby Joan	4·0	2·4
Hollandion	4·4	2·1

156. The table handed in by Mr. Lewin, of the Government Laboratory, pointed to a similar condition of things. The analysis referred to milks of a high class character and as will be seen by the figures below, where the ratio of condensation approximated to $2\frac{1}{2}$, *i.e.*, from 2·55 downwards, the percentage of fat estimated in the original milk never fell below 4, while, on the other hand, where the ratio more nearly approached to one-third, namely from 2·8 upwards, the percentage of fat in every case fell below this figure :—

Appendix XXVIII.

Brand.	Degree of Condensation.	Fat Calculated in Original Milk.
Ideal	2·48	4·63
,,	2·49	4·33
,,	2·52	4·50
,,	2·54	4·62
,,	2·55	4·45
,,	2·55	4·13
Sledge	2·80	3·86
,,	2·81	3·89
First Swiss	2·82	3·53
Viking	2·82	3·70
Ideal	2·85	2·97
Viking	2·85	3·56
,,	2·86	3·86
Sledge	2·92	3·98
Viking	2·93	3·32
First Swiss	3·08	3·47

157. To a person not conversant with the secrets and the methods of manufacture of condensed milk, it would appear that there is an affinity between the ratio of condensation and the quality of the original milk as shown by the fat in the condensed product, and that either the richer milk (in fat) does not require the same degree of condensation to bring it to the desired consistency, or the percentage of fat is diminished the longer the original milk is in process of condensation. Neither of these propositions, however, do I put forward, as no evidence has been given to elucidate the point. But in any case it is clear that in view of these figures, it would not be wise to insist on a ratio having, in effect, 3·3 as a minimum of condensation.

158. While it is not desirable, in my opinion, to fix a limit for the degree of condensation of milk, it is important that consumers should be in a position to judge of its feeding value, otherwise the addition of a large proportion of sugar would give an impression of richness which did not exist in the milk, and the amount of water which would have to be added in order to bring it to a sufficiently liquid state for purposes of consumption would be so great, in proportion to the milk solids, as to render the article practically valueless as a food, particularly for infants and children.

159. It does not appear from the evidence that there would be any difficulty on the part of the manufacturer in stating the amount of dilution necessary in order to bring the milk solids down to the same proportion as in ordinary new milk. The proportion resulting certainly could not be defined exactly, but with any standard it would always be necessary on the part of the manufacturer to allow a sufficient margin for variations, and in stating on each tin that the addition of a certain quantity of water would yield a milk containing at least 3·0 per cent. of fat and 8·5 per cent. of solids not fat—which are the limits I recommend—I have no doubt that the consumer would get a milk of a much higher quality than those figures represent. This indeed is the case at present, as shown in innumerable instances, although no standard is yet in force for condensed milk.

Chalmers, 3452.
Allen, 4804.
Lloyd, 6096.
Niven, 9670.
Lewin, 10632.

160. The principle of the above suggestion was advocated by the medical officer of health for Glasgow and others, while not pledging themselves to definite figures.

Richmond, 8450.
Fisher, 8890.
Dyer, 370.
Allen, 4728.

161. It may reasonably be urged, apart from such considerations as given above, that some standard should be recognised below which condensed milk before dilution should not fall. The evidence submitted on this point has been mainly or entirely of a scientific character and as such has not been questioned. Accepting the statement of Mr. Richmond, who is confirmed in essential points by the President of the Society of Public Analysts and Dr. Dyer, it appears it is an easy matter to determine accurately the nitrogen in condensed milk, and this bearing a ratio of from 6·25 to 6·38 to the proteids, which almost invariably correspond with the fats, a reliable standard for fat can be obtained on this calculation. The only objection which has been raised to this method is that an error in determining the nitrogen in the first instance would be multiplied 6¼ times in arriving at the proteids, but such an objection, would not in my opinion, hold good, seeing that in the hands of a careful and duly qualified analyst, such errors should not be made, and that if scientific evidence is to be used at all such considerations as to possible error should not be allowed to enter into the matter.

162. The question of the amount of sugar in condensed milk is an important one, and so far as it may be used for the purposes of concealing the true quality of the milk, I am in accord with my colleagues in their views both as regards condensed whole milk and condensed skim milk.

CREAM.

163. With regard to cream, I am fully in accord with the views of my colleagues, and indorse that portion of their report which deals with that subject.

RECOMMENDATIONS.

164. I beg to recommend the following:—

I. That regulations under Section 4 of the Food and Drugs Act, 1899, be made by the Board of Agriculture with respect to milk (including condensed milk) and cream.

II. (*a.*) That in the case of any milk (other than skimmed, separated, or condensed milk) the total milk solids in which are less than 11·75, and in which, during the months of July to February inclusive, the amount of milk-fat is less than 3 per cent., and in the case of any milk which during the months of March to June inclusive shall fall below the above-named limit for total solids and at the same time shall contain less than 2·75 per cent. of fat, it shall be deemed that such milk is so deficient in it's normal constituent of fat as to raise a presumption, for the purposes of the Sale of Food and Drugs Acts, 1875 to 1899, until the contrary is proved, that the milk is not genuine.

(*b.*) That any milk (other than skimmed, separated, or condensed milk) the total milk solids in which are less than 11·75 per cent. and in which the amount of non-fatty solids is less than 8·5 per cent., shall be deemed to be so deficient in its normal constituents as to raise a presumption, for the purposes of the Sale of Food and Drugs Acts, 1875 to 1899, until the contrary is proved, that the milk is not genuine. In calculating the amount of the deficiency the analyst shall take into account the extent to which the milk fat exceeds the limits above named.

III. That the artificial thickening of cream by any addition of gelatin or other substance shall raise a presumption that the cream is not genuine.

IV. That any skimmed or separated milk in which the total milk solids are less than 8·75 per cent. shall be deemed to be so deficient in its normal constituents as to raise a presumption, for the purposes of the Sale of Food and Drugs Acts, 1875 to 1899, until the contrary is proved, that the milk is not genuine.

V. (*a.*) That a regulation be made by the Board of Agriculture, providing that a label be affixed to every tin of condensed milk (other than that labelled machine, skimmed, or skimmed milk) before sale, such label to set forth the amount of water to be added to bring the contents to the same standard for milk solids as that set forth in paragraph II., viz., 3 per cent. of milk fat and 8·5 per cent. of non-fatty solids, and any condensed milk found, after the addition of the amount of water stated upon the label, to contain less than such percentage of milk fat and non-fatty solids, shall be deemed to be so deficient in the normal constituents of genuine milk as to raise a presumption, for the purposes of the Sale of Food and Drugs Acts, 1875 to 1899, that the milk is not genuine—*or, as an alternative*—

(*b.*) That any condensed milk (other than that labelled machine-skimmed or skimmed milk) in which the milk fat solids are less than the proteids shall be deemed to be so deficient in its normal constituents as to raise a presumption, for the purposes of the Sale of Food and Drugs Acts, 1875 to 1899, that the milk is not genuine.

165. I beg further to express the opinion:—

(*a.*) That the act of mixing water or separated milk with whole milk for the purpose of sale should be made a penal offence.

(*b.*) That any servant or employé adulterating milk with water or with separated milk for the purpose of sale without the knowledge or consent of his employer should be liable to all the penalties set forth in the Sale of Food and Drugs Acts, 1875 to 1899, instead of his employer.

(*c.*) That the milk of all firms who state—for the purpose of advertisement—that milk is retailed by them of a quality higher than the standard fixed by the Board of Agriculture should be judged by the standard they themselves fix.

(*d.*) That steps should be taken with a view to identifying, or earmarking, separated milk by the addition of some perfectly harmless substance, which would easily reveal itself upon analysis, so as to prevent its use for the purpose of adulterating new milk. Such substance should not depreciate the milk either to the eye or the taste, or interfere with its value as an article of food, and that a form of procedure should be adopted similar to that provided by Section 7 of the Food and Drugs Act, 1899, in regard to margarine.

(*e.*) That all vessels, including railway churns, used in the conveyance or sale of separated milk sold wholesale should be painted on the outside a red colour.

(*f.*) That as far as may be found practicable the procedure in collecting, forwarding, and retaining samples of milk, cream, and condensed milk should be uniform.

(*g.*) That in the case of milk being presumed to be adulterated the third, or reference, sample should be referred to the Government Laboratory, if a request to that effect be made by the defendant, and that the result be made known to both parties, before the hearing of the case.

(*h.*) That it is desirable in the case of condensed milk to limit, and in the case of condensed skimmed milk to exclude, the addition of sugar.

(*i.*) That the official standardising of the measuring vessels commercially used in the testing of milk is desirable.

166. In concluding this Report I desire to add my testimony to that of the other members of the Committee to the very efficient and able manner in which Mr. Rew, the secretary, has performed the duties of his office, and to the valuable assistance which he has rendered to the Committee during the whole course of the enquiry.

I have the honour to be,
Sir,
Your most obedient Servant,
(signed) GEO. BARHAM.

20th February, 1901.

COMMITTEE ON MILK AND CREAM REGULATIONS.

MINUTES OF EVIDENCE

TAKEN BEFORE THE

DEPARTMENTAL COMMITTEE

APPOINTED BY THE

BOARD OF AGRICULTURE

TO INQUIRE AND REPORT UPON THE DESIRABILITY OF

REGULATIONS,

Under Section 4 *of the Sale of Food and Drugs Act*, 1899,

FOR

MILK AND CREAM,

WITH

APPENDICES AND INDEX.

Presented to both Houses of Parliament by Command of His Majesty.

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MINUTES OF EVIDENCE

TAKEN BEFORE THE

DEPARTMENTAL COMMITTEE

ON

MILK AND CREAM REGULATIONS

AT THE

BOARD OF AGRICULTURE, 3, St. James's Square, S.W.

FIRST DAY.

Thursday, 1st *March*, 1900.

PRESENT:

Lord Wenlock, G.C.S.I., G.C.I.E. (*Chairman*).

Mr. George Barham.
Mr. George Cowan.
Major Patrick George Craigie.
Mr. S. W. Farmer.
Mr. Shirley F. Murphy.
Professor T. E. Thorpe, F.R.S.
Dr. J. Augustus Voelcker.

Mr. R. Henry Rew, *Secretary*.

Dr. Alfred Hill, called; and Examined.

Dr. A. Hill.
1 Mar. 1900.

1. (*Professor Thorpe.*) You are Medical Officer of Health for Birmingham?—Yes.

2. And you are also Public Analyst of that city?—Yes.

3. You appear here in answer to an invitation of this Committee?—That is so.

4. And you are prepared to submit certain subject matters as the basis of the evidence which you propose to offer here?—I am.

5. Taking whole dairies of cows, which have been milked under your own observation and direction, within what limits have you observed that the total solids are contained in such milks?—I have never found them fall below 12·68 per cent. in any dairy.

6. Is that result taken from the mixed products of herds of cows?—From the whole of the cows in a dairy—five or six cows, as the case might be, and then analysed by myself. The cows were milked in my presence.

7. In the case of samples from individual cows what have you observed?—The percentage of the total solids, taking the average of individual cows, was 13 per cent., which is higher.

8. (*Chairman.*) May we know how these individual cows were selected, were they taken at random?—No, they were not, they were taken from a large herd of over a hundred to which I had access.

9. Did you take any one cow which happened to take your fancy, or were they picked out for you?—Oh, dear no. I had milks from every cow; I think there were over a hundred.

10. Each cow was tested separately?—Yes, certainly.

11. (*Professor Thorpe.*) Of course, the probability that a consumer gets the produce of an individual cow is very remote?—I do not think he ever gets the produce of an individual cow unless it might be in some little village where a man got the milk from the cow of a friend. In the market I do not think the milk of individual cows ever appears.

12. May we take it that it is not within your knowledge as the Public Analyst for Birmingham that any prosecution has been brought upon the results of the analysis of the milk of an individual cow?—That has never been the case.

13. Could you give the Committee a concise statement as to the limits of variation in the samples of genuine milk which have come within your cognisance?—Table 2 (*see Appendix, No. I.*) shows the analysis of milk from single cows of Birmingham and the district, 111 samples being taken. The total solids were found to vary from 11·18 up to 17·01. If you will refer to that table you will see the number of samples of different values making up the percentages in the third column. You will find that of milks varying from 11·18 to 11·49 there were 5·4 per cent. of samples; of milks varying from 11·50 to 11·99 there were 9·9 per cent., making a total of only 15 per cent. below 12; while the numbers above 12, including 12, varied from 12 per cent. to 17·01 per cent., making a total of 85 per cent. of the whole. So that not only is the larger percentage of these milks—85 against 15—very preponderating, but you will observe that if you are to take 12 per cent. of total solids as a reasonable standard of milk, while the deficiency is only from 11·18 to 11·99 under 12 per cent., the excess of value is from 12 to 17·01 per cent., thus giving an immense advantage to the richer milks.

14. At the same time numbers so high as 17·01 must be exceptional?—They are very few—only 2·7 per cent., you see, from 15 to 17·01 per cent.; but still there is always that possibility in a herd of cows, so that though some cows may give a deficiency of fats and solids yet others in a herd of cows more numerous give a larger excess in proportion, which may get up to 17 per cent.

15. But it is surely rather accidental, is it not, that the average results of 111 single cows should have given a higher value than the average got by mixing the produce of a large number of cows?—The mixed milk of the cows I have referred to already was from cows only five or six in the dairy, and they were fed specially on grains and the poorest food, with a view, according to the declaration of the owner of the animals, to produce a large quantity of milk, irrespective of quality.

16. In the case of a single cow was there no such selective action at work?—In the case of very few.

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Table 3 (*see Appendix, No. I.*) shows that. As you will see from that table, four samples contained from 2·36 to 2·79 per cent. of fat—they formed 3·6 per cent. of the total samples. Then there was another class with from 2·80 to 2·99 of fat, which formed 2·7 per cent. of the samples, or cows. The next class varies from 3 to 3·19 per cent. of fat, and this referred to 5·4 per cent. of the cows. Being rather a stickler for 3·5 I make that the last entry of the class, 3·20 to 3·49 of fat, and this includes the large number of 12·6 per cent. of the samples, making of the 111 samples 24 per cent. up to from 3·50 or 3·49, and leaving 76 per cent. above 3·50, namely, between 3·50 and 8·44, so that in Table 3 again we see how greatly 8·44 is over 3·5, compared with 2·36, as below 3·5.

17. I assume in the case of the single cows that the cows were milked down?—Of course they were milked out properly. You may get any results from a cow partially milked. I have found 1 per cent. in them in such a case.

18. At what time of the day were the milkings taken?—It is a long time ago, but I should think it would be about 4 o'clock in the afternoon.

19. Then with respect to the particular point before the Committee—namely, as to the question of limit, what have you to suggest?—I always act on the belief that no milk should contain less than 12 per cent. of total solids—that is a very liberal allowance—liberal, I mean, in favour of the milkman, and that the fat should reach 3·5.

20. The fat should be 3·5, do you say?—Yes. I know that is rather above the usually accepted standard, but from my own experience, which extends over nearly 40 years, it seems to me that that is a fair standard both to the milkman and to the consumer, though, of course, it is very often higher than that—it is very frequently 4 per cent.

21. In other words, you think that an analyst would be justified in raising a presumption against the genuineness of the milk if the total solids were lower than 12 per cent., and the fat was lower than 3·5?—If from a dairy, yes.

22. (*Chairman.*) May I ask here what you define as a dairy; how many cows would constitute a dairy?—I think five might be considered a very proper number—even less probably, I could not say, but I can speak to five positively from my own experience. I will not say that three might not rectify the average.

23. (*Professor Thorpe.*) Is it your impression that there is a great deal of adulteration of milk?—There is a great deal.

24. In Birmingham?—Yes, it is constant and habitual.

25. Is there much milk sold in Birmingham which you believe to be adulterated, and which is yet above the standards, such as they are, under which public analysts at present work?—Certainly. I have no doubt about it at all—not the least.

26. Do you think it is the practice of milk vendors to mix their milk with separated milk?—Yes.

27. Or to directly abstract the cream, and yet keep within those limits which are at present in operation?—Yes; and with the intention of keeping within those limits. If you had a lower standard than you have already, the adulteration would be still greater no doubt.

28. Do you think the natural effect of the prescription of a standard is to cause milk vendors to work down to that standard?—Yes, I do most certainly think so. I think there is as much ingenuity on the part of the trader to impose upon the public as there is desire on the part of the public to detect the false trader. I think science is pressed just as much into their service for that purpose as it is into ours.

29. The greater quantity of the milk supplied to Birmingham is, I presume, vended by middlemen or associations of persons?—Yes, it comes in churns by train in the morning, and certain middlemen, as you say, large purveyors, take this milk and distribute it to the shopkeepers and little vendors.

30. Where do you think the dilution or the abstraction takes place?—On the farm.

31. (*Chairman.*) May I ask you what makes you come to that opinion?—Because there appears to be no means of diluting the milk from the time it leaves the farm to the time it is taken by our inspector at the railway station. Nobody could interfere with it but the man in charge of the train, or some railway official.

32. I was not aware where the inspection took place; as I understand now it takes place before it reaches the middleman?—Yes, certainly it does—on the platform of the railway; the inspector is there to receive it.

33. So he interposes between the producer and the retailer?—Yes. He pours a churn of milk into an empty churn, and back again, so as to be quite sure that the sample is perfectly mixed.

34. In the case of this adulterated milk in Birmingham which your inspectors have inspected and reported upon as adulterated, do you try and get a conviction against the producer?—No, we proceed against the purveyor in Birmingham.

35. The man to whom the milk is consigned?—Yes.

36. But he has had, on your showing, nothing to do with it?—He takes the milk afterwards; after we have taken our sample he has the milk.

37. And you take proceedings against him?—I think so. I am not quite sure that we do not sometimes proceed against the farmer. We do proceed against the purveyors very often I know, but I am not quite sure whether we do so exclusively, and whether we do not sometimes possibly get at the farmer himself; I believe we do. I have not had much to do with prosecutions; my duties end with making analyses and giving evidence.

38. You can get to know?—Yes, I can, and I can send you word certainly. I think we do proceed against the farmer sometimes.*

39. (*Professor Thorpe.*) I see you lay considerable stress in the course of your *précis* upon the aggregate amount of solid matter in the milk as being the standard, rather than separating the two parts of fatty solids and non-fatty solids?—Yes, because I have been struck for a long time with the fact that where fat is low naturally the proteids and the other ingredients in the milk—the solids not fat—are proportionately higher; and that where you get lower solids not fat you get a proportionate rise of fat. Therefore, I think it is useful in fixing standards not only to regard the amount of fat present, but also to regard the total of solids. I do not see why they should not both be accepted.

40. Assuming that this Committee came to the conclusion to recommend limits, in what form would the limit be worded; what would be your definition of the limit?—It would be on the same principle as the present one. It is pretty well understood now, I think, that the proportion admitted as proving the milk genuine is 3 per cent. of fat and 8·5 per cent of solids not fat. It would simply be necessary to say the total solids should be 12 per cent., and the fat should not be less than 3·5 per cent., or whatever you choose to fix.

41. Pardon me; I judged that your recommendations rather led to fixing the limit upon the aggregate amount of the total solids, and not upon the individual proportions?—I am disposed to accept both; to take the total solids as not below 12, and the fat as not below a certain point.

42. I should like to know exactly in your own words how you would define those limits?—I do not think I can put it better than the way I have done. I should say that a milk must never fall below 12 in its total solids, and that its fat must never fall below the point upon which your Committee decides.

43. The one thing follows the other?—You have my evidence and experience to the effect that the fat from a dairy of cows does not fall below 3·5; you have that fact before you, and if you thought that figure too stringent of course it would be competent for you to fix a somewhat lower one—at the same time higher than the present one.

44. But how would that affect the total aggregate solids?—It would not affect them, of course; it would simply be a feature in them.

45. I gather that your recommendation would be that the limit should be drawn at a percentage of 12 of total solids?—Yes, and that the percentage of fat should be that which I have suggested to you, but of course I do not press that. The amount of fat should also be defined.

46. You suggest the limit of the fat should be fixed at 3½ per cent.?—Yes.

47. (*Dr. Voelcker.*) I will just follow up the point that Professor Thorpe has mentioned. I take it that if a standard were only fixed for total solids, and no reference were made to the fat as well, you would not be able to discriminate between a genuine milk and a milk to which separated milk had been added?—No, I do not think you would.

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* The witness subsequently wrote: "Since January, 1897, 28 summonses have been taken out against 13 defendants who were farmers and 13 summonses against 12 defendants who were middlemen."

48. And similarly in the case of milk from which cream had been removed?—Certainly.

49. Therefore you would hold it essential to define a fat limit as well as a limit for the total solids?—Yes, I should.

50. I take it too, following from that, that you would regard a limit or standard of fat and total solids as more satisfactory than one which involved the statement of the solids not fat?—Yes, I think so.

51. Is it not the case that where you find a low amount of solids not fat you would be guided a good deal in determining whether a milk was adulterated or not, by the amount of ash contained in it, and by the albuminoids?—Yes; the percentage of albuminoids is very valuable, I think. I have generally found that they amounted to a half per cent. of nitrogen in the milk pretty regularly. With regard to the ash you could not go upon the quantity of ash unless you analyse the ash, because you might have salt or borax, or any other adulterant added, which would come in the ash. That would make it very tedious to analyse the ash.

52. Is it not the case that in a milk that is naturally low in solids not fat, you would find it low in milk-sugar?—Yes, it would be low then, because it would be watered.

53. If you find a low ash, and low albuminoids, what would you have reason to believe?—I should be almost prepared to take my affidavit that that was a watered milk.

54. Then you would also exclude from any consideration the milk of cows that were unhealthy?—Yes, certainly I would exclude any cows which were starved or ill, or improperly fed.

55. And you would in fixing any standard be guided by the average of a herd rather than by individual cows?—Yes, certainly. Even the standard of herds is somewhat variable, but the standard of individual cows is very variable indeed.

56. You would agree, I take it, that a standard if fixed would have to be a general one, and that there should not be any attempt made to discriminate between morning and evening milk?—I do not think there should. They do not vary very much, and they are very often mixed. I do not think that would affect the question very seriously.

57. But it is a fact that the morning milk is poorer in quality, is it not?—It is poorer in quality, but larger in quantity.

58. Therefore, the standard should take in the poorer milk?—Certainly. That would make the figures I have adopted quite safe.

59. The figures that you have given are, on the whole, afternoon milks, are they?—That figure which I gave as 12·68 I know is on the afternoon milk, and I believe all the others are, but I am not quite sure about that. They must be, because I am quite sure I should not be four miles out of Birmingham at five or six o'clock in the morning to see the cows milked; therefore it must have been afternoon milk.

60. Have you noted any great variation with regard to the time of the year?—A little, not much. The poor months are the winter, the cold months and the spring months, but I do not think the variation sufficient to affect the question on the basis upon which we are considering it.

61. If a standard somewhat lower than you have mentioned with regard to the fat, say 3 per cent. or $3\frac{1}{4}$ per cent. instead of $3\frac{1}{2}$ per cent. were fixed, would it lead, in your opinion, to any increase of adulteration as against the fixing of a standard with $3\frac{1}{2}$ per cent. of fat?—Yes, I think it would lead to the milk being skimmed to a certain extent.

62. (*Chairman.*) If you fix the limit below 3·5?—Yes, if you lowered the limit for fat.

63. (*Dr. Voelcker.*) If a limit of $3\frac{1}{4}$ per cent. were taken instead of $3\frac{1}{2}$ per cent?—Yes; if lowered from 3·5 to 3·25 or 3·3.

64. Do you mean that the difference would be sufficient to make it worth while to adulterate?—Yes, where there is a large amount of cream concerned, certainly.

65. Does it not strike you that perhaps a limit of $3\frac{1}{2}$ per cent. of fat is rather high for a morning's milk, taking the farmer's average all the year round?—I think it would be reached; but, as I say, the morning and evening milks are very much mixed, and it is keeping the morning milk for mixing with the evening milk that offers the temptation very frequently to removing the fat.

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66. One question with regard to the transit of the milk: has it come to your experience at all that milk may leave the farmer perfectly genuine but reach the purveyor in an adulterated condition, the adulteration having taken place in transit?—No, I have no evidence of that; it is a most difficult thing to trace. You see the churns are not locked; they are left open by the railway companies, but they ought to be locked.

67. That is a point I meant to ask you—Whether the milk thus coming in transit is sent in locked cans?—No, they are never locked; the railway companies will not allow it. At the same time the greatest evil that can follow is that very likely an official might dip in a pipkin and take some out. I do not think he would adulterate it in the true sense of the word, but he would take some out perhaps.

68. Referring now to the quantity of total solids, would that be at all affected in the case of preservatives being added?—No, the preservative in the case of boric acid seldom amounts to more than 0·07 or 0·08 up to 0·1 per cent., which makes 49, 56 and 70 grains respectively of the adulterant in the gallon, and I have found as much as 126 grains per gallon, but that is a very small percentage; it is only a decimal figure.

69. The fact that a certain increase of total solids might be due to the addition of preservatives would throw more emphasis upon the necessity of having a fat standard as well?—Yes it would, very slightly.

70. The last question I have to trouble you with is with regard to cream; have you any views as to a standard that might be fixed for cream?—No, I do not deal with cream for analysis. I have done very little in that way.

71. Cream, I take it, is sold in Birmingham?—Yes, it is; but we never have it presented to us for analysis.

72. It does not come before you?—No, the inspector does not submit samples of cream to me.

73. Does condensed milk come before you much?—No.

74. (*Chairman.*) Who in Birmingham examines the condensed milk which is sold in tins and so on?—I think if it were to be examined I should examine it, but, as a fact, I never get it submitted; my inspector does not bring me any samples. I have nothing to do with the indication as to what samples shall be purchased; I have simply to receive such samples as are submitted and to analyse and report upon them. I do not suggest that anything should be specially purchased.

75. I thought, as Medical Officer of Health, you would have to deal with it if it does not come within the purview of your duties as public analyst?—It never has been done.

76. You receive instructions from whom?—From the Health Committee; I should not act except under their direction.

77. Then if it came to your knowledge or you thought a great deal of adulterated milk was being sold in the form of condensed stuff in tins, what would happen?—I have had one or two samples submitted to me, and they proved very poor indeed, but they are very few compared with the samples of milk which I get. I have had thousands of samples of milk, but I have only had units of condensed milk to analyse, and some of those have been genuine.

78. Condensed milk does enter largely in competition with British milk, does it not?—I believe it does, and it is consumed in Birmingham.

79. The unfortunate native producer is justified, then, in wishing that we would leave the foreign alone?—The commoner kinds of condensed milks are generally very poor in fat, but there are certain brands which are exceedingly good. The First Swiss brand is a genuine milk, and the Nestlé's brand is all very good milk, but there are a great many others where the fat has been abstracted; in fact, the milk is condensed from skimmed milk, so they are very poor in fat indeed. There is great ingenuity displayed by the people who issue these goods in taking care to hide by one end of the label that statement on the label which says it is made from skimmed milk. There is a great deal of fraud in that way. But I have examined very few samples of it.

80. (*Dr. Voelcker.*) You say that from your knowledge of what you have examined—these units, as you term them—you know that many of them are poor?—Many of them I know are poor, but I have not had many samples. They are starvation to the children fed on them, there is no doubt about that.

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81. Do you think the population buys them very largely?—Yes, I think so. I do not think it is so much in favour, perhaps, in Birmingham as it is in many other places, because the supply of fresh milk to Birmingham is very plentiful. Of course, people prefer fresh milk to condensed milk when it can be readily got. The excess of sugar in condensed milk is very objectionable to some people, and most of the condensed milks do contain a large quantity of sugar—not all, but nearly all.

82. (*Major Craigie.*) With reference to the question of condensed milk, I only want to ask you whether the attention of inspectors at Birmingham has been called to the alteration made by the new Act in respect of marking?—I do not know whether the Committee has drawn their attention to it; I have not.

83. As a consequence of the passing of this Act (especially in reference to Section 11), have not samples of condensed milk been submitted to you with a view to seeing whether they were correctly described?—No; they have not. The Act at present, at any rate, has not been very long in operation. I dare say I shall have samples further on.

84. With reference to the inspection of milk on the railway platforms, I understood you to say that the railway companies forbid the churns to be locked?—They do, emphatically.

85. Is that so in every case?—In every case, I believe. It is a great grievance on the part of the milkmen that they cannot induce the railway companies to allow them to lock their cans.

86. Are you referring to the carriage of milk at a particular rate below the ordinary rate?—No, I am referring to all milk.

87. In all cases?—In all cases.

88. Would that apply to all the railway companies serving Birmingham?—I believe so; as far as my knowledge goes it is so; I have heard of no exceptions.

89. You are aware that the question was raised in Parliament during the discussion on the Bill?—Yes, I believe it was.

90. And that correspondence has taken place to which attention has been called in the Press, between the Board of Agriculture, the Board of Trade, and the railway companies?—Yes.

91. With the result that the reply of the railway companies was that the churns might be locked?—Indeed?

92. You are not aware of that?—No, and even if that be so it does not follow that the companies coming into Birmingham allow their churns to be locked.

93. Of course, I can only ask you what is known to you personally?—As far as I know they are not locked.

94. Are you speaking of information with reference to the last six months?—Of the whole time in which my attention has been drawn to the question of milk, but then, as I say, the Act has been in existence only for a short time.

95. There has been no change of practice?—Not under the Act at all.

96. I am referring now to the practice of locking churns?—I have never heard of their being locked. I have always heard complaints of their not being locked.

97. With reference to the breed of cows, have you any note of the particular breed of the cows that are referred to in the extreme cases, either of the maximum or the minimum limit?—I am not at the present moment prepared to tell you what they are. I think they are generally Midland breeds—Shorthorns, or breeds of that class. They are not special breeds, they are not Dutch breeds, they are not the Scotch breeds. I should say they would be Herefordshires and Shorthorns, and that class.

98. Did I rightly understand your answer to my colleague, Professor Thorpe's question, that in Birmingham there was served to customers in no case the milk of an individual cow—or practically in no case?—That is so.

99. As a matter of practice that is so?—Yes.

100. But you would not apply the same principle to the cows of small districts in the country, would you; the consumers outside of a town may be served by individual cows, may they not?—Yes, possibly, just as a neighbour may; but then, those milks do not come into Birmingham, you see. The milks sent up to Birmingham are sent by farmers in a large way of business.

101. (*Mr. Cowan.*) I think you stated that the adulteration of the milk sent to Birmingham generally took place on the farms?—The milk sent to Birmingham, not the milk in Birmingham. I dare say it is adulterated possibly by the middleman sometimes, and often by the individual retailer, but speaking of the milk on the way from the farm to the station in Birmingham, I say when adulteration is found in such a milk it is done by the farmer.

102. I understood you to say the dilution of the milk was generally done on the road?—Between the farm and Birmingham it is done by the farmer; when it gets to Birmingham, of course it is done over and over again, sometimes two or three times, I should think.

103. Does the purveyor never adulterate, think you?—Yes, I believe the purveyors may occasionally, but as a rule they are rather particular, as they know the danger of it. They do so sometimes.

104. Has anyone amongst the purveyors been prosecuted in Birmingham?—Yes.

105. I think you stated that the railway companies do not allow cans to be locked?—That is so.

106. I am under the impression that some railways do allow cans to be locked now. Of course, if cans were locked it would make all right, because there may be a danger, may there not, of milk being abstracted?—Taken out by officials of the line, do you mean?

107. Yes?—Certainly there is a danger of that.

108. It has been done?—There have been petty thefts. A man takes a pint of milk out, it is so easily done. That would not be adulteration—that would simply be a theft of the milk.

109. To avoid that, would you not consider that the inspection should take place at the station of delivery?—At the farm, do you mean?

110. At the farm?—That would be of no value unless the meddling with the milk was prevented by locking the churns—otherwise you might inspect it at the farm, and it might be right then.

111. It has been proved that adulteration has taken place after it was sent from the nearest station to the farm, and before it arrived at its destination. There is another point. Do the inspectors take samples from a single can?—They take samples from what churns they like. They often take samples from several churns, and some churns are found to be adulterated and others from the same farm, not.

112. May it not be they were not adulterated, because I know in large dairies in the part of the country from which I come, for instance, that there may be eight or ten milkers. The first portion of the cow's milk is perhaps put into cans and refrigerated, and that cannot be so valuable as the milk which comes later?—That is a matter of business, of course; a man who does that does not know his trade.

113. It is not easy on a farm to put it into a great vat before you get it refrigerated?—But a cow should be altogether milked out before the milk is sent from the farm.

114. The cans will not hold all the milk?—I say the cows should be entirely milked.

115. Yes, but supposing a cow gives more than a can full, then, of course, the milkers have to go with the first of the milk and to put it into the cans?—It is the business of the farmer to see that his milk is properly mixed just as it is the business of the retailer to see that his milk is properly stirred up before he sells it.

116. Would you not get over that difficulty by allowing the inspection to be taken of the whole of the consignment instead of one can?—Not unless the whole milk was mixed together.

117. If you took it out of every can it could be done?—It would be a very complex matter.

118. May I ask in what form adulteration generally takes place?—Sometimes creaming alone, sometimes watering alone, and sometimes both watering and creaming.

119. Did you say to Dr. Voelcker that it is not possible to detect the addition of separated milk?—It is possible.

120. Is it?—Certainly.

121. With all quantities?—Yes, within the possibilities of chemical analysis.

122. Any quantity of separated milk could be detected in full milk?—Yes, if it were worth putting in—that is, if it were a quantity worth adding.

123. (*Chairman.*) Would the presence of a preservative make any difference?—It would alter the ash if it were a solid preservative. If it were formalin it would not affect the ash.

124. (*Mr. Cowan.*) I see you state that 12 per cent. of solids and 3·5 of fat would be your limit?—That is what I always calculate upon in reckoning the amount of adulteration.

125. Would you not consider that a milk giving 3 per cent. of fat and 12 per cent. of solids would be a very good milk?—It would not be, I think, genuine.

126. It would not be genuine?—No, it is too low; it is in favour very much of the farmer or the vendor, but it is against the public. When you bear in mind the enormous quantities of milk that are sold you will see that the pilfering which goes on amounts to many thousands a year, scores of thousands, perhaps, even in one place like London.

127. So far as you know, condensed milk is not much used in Birmingham?—No, it is not much used.

128. It is said to be very largely used by the working class in most large cities?—It varies very much in quality, but it is generally poor.

129. I think you stated condensed milk was generally made from skimmed milk?—It is most frequently made from skimmed milk; it is deficient in fat.

130. Would you not think that it should be made from full milk?—Certainly; and where it is not it should be very distinctly labelled to that effect, instead of which they label it in obscure letters that it is made with skimmed milk, and they freqnently get the edge of the label over the statement so that the people are not even aware of the intimation.

131. (*Mr. Barham.*) With regard to sealing the cans before they pass into the railway companies' possession, or the locking of them, do you know of your own knowledge that the railway companies have, or any one of them has, refused to allow it to be done?—Yes.

132. Of your own knowledge?—Yes, I have heard it given in evidence in court that the company did not allow it.

133. Can you tell me which company that is?—No, I could not. It would be either the London and North-Western or the Great Western, and it might be the Midland. Those are the three railways that run into Birmingham.

134. You cannot tell me the name of it?—No, I cannot.

135. (*Chairman.*) Do you know what reason the railway companies gave for forbidding it?—No, I am not aware what their reason is; they all refuse.

136. Without stating any reason?—They may give a reason, but I have not heard their reason.

137. (*Mr. Barham.*) You speak of the milk on the rail not being adulterated or only being adulterated in very rare cases; I mean while it is on the rail?—I think that is so.

138. But you say it might be pilfered?—Yes.

139. The probability is that that occurs very frequently; do you think so?—I do not like to think ill of my fellow-creatures. It may occur sometimes.

140. A great deal of the milk arrives at the Birmingham station the previous evening, does it not, very often?—It arrives early in the morning sometimes.

141. Some arrives the previous evening, I suppose?—I do not know; I think not. I think it all comes in the morning.*

142. What time does it arrive in the morning?—I should think about seven o'clock.

143. Seven in the morning?—Seven or eight o'clock.

144. I am surprised to hear it. I cannot, of course, say it is not so, but it is the custom in London, as you are probably aware, for milk to arrive here at two or three o'clock in the morning, and in a great many instances it comes up from the country over-night?—No doubt you get milk from a much longer distance than we do in Birmingham.

145. Anyhow you have seen at the stations, I have no doubt, churns of milk standing full?—Yes.

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146. Perhaps for some considerable time?—Yes.

147. Supposing that milk were pilfered, and two quarts the size of the guard's bottle taken from the top of it, would not that be nearly all cream?—No, it would be mostly milk. My experience of dipping a can into a milk with cream on it is that the cream swims away as the can rises in the milk, and you will get very likely the richest milk after you have ladled out the churn till it is nearly empty.

148. Then if you dipped from the top of a churn that had been standing some time, and the cream was rising, that being the lightest portion of the milk, as soon as you put a measure or a guard's bottle into that churn the lightest portion would fly immediately to the bottom and you would get the heaviest portion at the top?—I do not say the lightest portion goes to the bottom.

149. You said it would be?—I said that on a vessel or can being dipped into the milk, and being brought up again out of the milk, it would displace the fat and it would not contain an excess of fat.

150. You are aware that a railway churn is three feet high?—Yes.

151. A guard in dipping his bottle would only dip in the bottle perhaps a foot deep; he would not push that bottle to the bottom, and therefore he would of necessity take the milk or cream from the top?—He would push away the cream; besides it does not separate much in transit; that is important.

152. I do not mean a glass bottle; I mean one of the tin cans which the guards carry?—If you take off the surface of the milk you will take off the cream; there is no doubt about that. But if he dipped the thing thoroughly into the mass of the milk I do not think he would get more than his share of the cream, if he got his full share.

153. And if he dipped the cream from the top that would practically be an adulteration?—Certainly it would be a sophistication, which is called adulteration.

154. The remainder of the milk would not contain its proper proportion of butter fat?—The remainder would not.

155. Therefore, the farmer would be liable to prosecution supposing a sample of that milk to be taken?—He would.

156. Or the man who retailed it would?—Yes.

157. Now the milk in Birmingham is two meals milk, I think you said, invariably—they mix together the a.m. milk and the p.m. milk, and it is always sold, or usually sold, in that condition?—I said it is often so, not invariably so. It is done by the farmer; he saves the evening's milk and mixes it with the morning's milk, and sends the mixture in early in the morning.

158. Then if he does that he must milk his cows very early in the morning, in order to have the morning's milk ready to mix the evening's milk with it, to cool it, to send it to the station, to deliver it to the railways, and to get it into Birmingham before seven?—I did not say before seven—I said about seven or eight. I am not quite sure what the hour is. I do not meet the milk itself.

159. That is quite true; I do not wish to entangle you at all?—I wish to give you all the information I can.

160. I am sure you do?—Those are points with which I am not personally acquainted. I can only speak by what I gather at the time the inspector brings me the samples and what he says about having to meet the trains in the morning. I can really not give you my own experience. I can only tell you what I have heard.

161. Supposing milk arrived in Birmingham about 8 o'clock in the morning, it would then, would it not, be too late for the morning breakfast, and would have to be kept till the afternoon?—Possibly, but not very likely.

162. In that case, supposing it was the over night's milk, that milk would then be twenty-four hours old before it was really consumed or sold in Birmingham?—Yes—which is not too long if the milk is properly kept.

163. I will not say it would be an easy thing to do, but you think it would keep satisfactorily twenty-four hours before it was retailed?—Yes.

164. During the hot summer weather?—Yes, I think it would keep twenty-four hours.

165. Do you know the Birmingham Dairy Company?—Yes.

166. I do not know if you do any business for them

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* The witness subsequently wrote: "On enquiry I find that some comes later in the day, but such samples as have been submitted to me have been bought generally in the morning."

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at all—do you do any of their work?—No. I analyse samples that are brought from them and submitted to me, but I never know which samples they are. I never know that they come from that dairy company or from whom they come.

167. It is a company, I believe, with a fairly good reputation?—Yes, very good.

168. Do you think it is their practice to mix the morning's and evening's milk together before they sell it?—I could not say at all; that is a detail I am not acquainted with. They are very particular about their milk. They have cold stores, and refrigerate it very carefully. They sell very excellent milk.

169. With regard to the a.m. and p.m. milk, I think you said you had an experience of forty years; can you tell us the difference of the butter fat that is usually found between the morning's and the evening's milk?—No, I have never been able to differentiate them positively.

170. Does it vary to the extent of one per cent, think you?—I could not say, but I should think not.

171. Do you think it varies about 0·5 per cent.?—That I could not say. I would rather not give an answer to that question.

172. You do not know what you receive?—An analyst does not know what he is receiving; it may be the morning's milk, it may be the evening's milk, it may be a mixture.

173. That is quite true?—I do not know, and I do not suppose the inspector who submits the sample to me ever knows which it is.

174. Supposing it did vary to the extent of one per cent., that would bring down the limit of fat that you suggest a half per cent., would it not?—Yes, but you see I base my opinion upon the milks I had actually examined, not upon any theory about morning and evening milk. I have given you the results of my actual examinations.

175. That is quite true, but you cannot tell me the difference between morning's and evening's milk?—It is so slight.

176. If the Committee find by other evidence that there is a variation to the extent, say of one per cent. or of a half per cent., that would reduce your butter fat by half per cent., whatever that might be, would it not?—Yes; I am quite sure they will not find it though.

177. But it would if it were so, would it not?—Certainly; that is a mere matter of arithmetic; providing the volumes are equal that were mixed.

178. But supposing the volume of the morning's milk was larger than that of the evening's milk—say was two-thirds in proportion to the evening's milk, that would reduce the butter fat to a still greater extent, would it not?—Yes, certainly; it would make it poorer.

179. You spoke of cows being starved and ill fed. Have you ever found any cows being starved that were giving milk?—My acquaintance with farms is not very intimate.

180. You see, it is an unprofitable thing for a farmer to starve his cows; first of all they would give no milk, and in the next place he would lose on their carcases, and lose tremendously?—I know a farmer has been prosecuted for doing it.

181. You do not know whether they were in milk or not?—No.

182. What do you think constitutes an ill-fed cow?—Cows fed almost exclusively upon grains, with only a little hay, and never turned out; I should call that bad feeding and bad treatment. Those cows would not be healthy.

183. Of course, not turning them out would not be bad feeding, but it would be bad treatment?—It would intensify the ill-effects of bad feeding.

184. On the other hand, I think we have it on very good authority that milk produced under cover and milk produced in a shed usually contain more solids than milk produced in the open?—I do not know; I myself prefer the milk from a grass-fed cow—from the open.

185. I quite agree with you, but I am speaking as regards the analytical point of view?—You may force certain ingredients into the milk, no doubt, by artificial treatment—storing and feeding and warming.

186. You think feeding cows on grains would be ill-feeding?—It would give a watery milk.

187. Take straw now, would that be a good food, in your opinion?—To a certain extent, if you give them a mixture. I think if you give straw and other poor things like that you should give some kind of cake mixed with it.

188. What about roots, such as mangolds?—Very good indeed.

189. Would they give good milk?—All sugar roots would.

190. You think they give good milk?—I do not say entirely; the diet should be mixed in that case.

191. Take potatoes, for instance?—I have no experience of potatoes.

192. You would not call them ill feeding?—It is good feeding, I think—it is starchy and nutritious.

193. In many parts of England and Scotland large crops of potatoes are grown, and what are called the "chats," or small potatoes, are usually fed to the cows?—Raw?

194. Yes; they are not wasted, they are fed to the cows. I was wondering whether you would exclude those or whether you would include them in your term of ill-feeding?—It is rather beyond my record I am afraid.

195. In the way that you have arrived at these figures you have on some occasions apparently found a very large amount of butter fat?—Yes.

196. Do you in these cases imagine or believe that the party from whom it was purchased knew your inspector and gave him a sample from the top of the pail or the vessel or churn, as the case might be?—I believe that may have happened with retail dealers in the town, but I do not think it happened in the case of the large purveyors or the farmers.

197. If it happened in the case of retailers it would go to swell your average?—It would be a very exceptional case. It would be done under fright; a man knows he is selling a bad milk, he sees the inspector coming in, he rushes into the back place of his premises and throws in a lot of cream and overdoes it very considerably. But I do not think that proves anything; it is quite an exceptional case.

198. If an ignorant person were in charge of the dairy, and dipped from the top of a vessel—a tureen on the counter—or from the railway churn that had just come in, and gave an unusual proportion of cream, that would still go to bring up your average?—Certainly, but then also it would bring down my results if he got the milk from below and not the fat from the top—which he is just as liable to do, and I think more liable.

199. Supposing that he supplied a sample to the inspector low down in the churn from out of the vessel that had been standing all day, at 1 or 2 o'clock perhaps in the afternoon, and that was very poor in fat, you would register that as adulterated, would you not?—Where he got too much cream in his milk, do you mean?

200. Where he had too little; supposing, for instance, he might have had a hundred people in the course of the morning supplied with milk from one vessel, and dips from the top, of course—you know the system, I suppose, it is the same in Birmingham as elsewhere—they take it from the top and not from the bottom——?—Certainly.

201. They dip from the top, and after a time nothing remains, but, of course, a few quarts of milk at the bottom?—Yes, which is generally the richest.

202. The richest in butter fat?—Yes.

203. That supports what you said previously, viz., that when you dip a measure into the churn the butter fat goes to the bottom?—Not goes to the bottom, but it is pushed aside by the rising can. It does not go to the bottom; you cannot get it to sink to the bottom, because it is specifically lighter than the other part of the milk.

204. At all events, if a sample of that kind was bought and it had less than its proportion of butter fat, you would consider it adulterated, of course?—Certainly, and it would be, because the man conducting a trade is supposed to know his own business and to take the trouble to carry it on properly, and he should mix his milk before he sells any—he should stir it up.

205. I do not justify the man in what he is doing?—I am explaining how it might be obviated.

206. In your *précis* you speak of average milk; very frequently you refer to averages. In dealing with cases of adulteration in Birmingham, supposing you had twenty good samples from one retailer and one bad sample, would you put the results of the bad samples with those of the good samples, and prosecute him or otherwise, according to his average?—No, certainly not. I should prosecute

him on the adulterated sample, and say nothing about the others. I have nothing to do with the pure samples. I never certify them. The law does not require me to do so. I only certify the impure ones.

207. Then you speak of a farmer knowing his business, and all that kind of thing; you know, of course, how rapidly cream rises, how rapidly butter-fat rises, how constantly, I was going to say, the component parts of the milk are in motion; do you expect that a cowman at 15s. a week should be acquainted with all those facts, and that he should, with the precision of a scientific man, divide the milk in proper proportion from his several cows, and get their milkings into the respective churns, so that every churn might be alike?—He ought to mix the whole lot.

208. You would hardly expect that from men in that condition, would you?—I do not see why not. If he put into the churn the yield of a few cows it would be near enough, I have no doubt, to give a fair average. They know there are poor yielding cows, I have no doubt, and they know there are rich yielding cows.

209. Supposing that a herd yields a churn and a-half of milk and one churn is filled first, as it would be in the ordinary course of business, I have no doubt, and the other churn is only half filled; I do not know what the Boer farmers may do, but our English farmers, as a rule, do not get up at 4 o'clock in the morning to see their cows milked, consequently the cooling and the sending off is left to the cowman, and if that cowman finds that he has one churn or half a churn over, and desires to equalise them, and takes by dipping from that churn say a couple of gallons or so in order to equalise them, do you not think that that churn from which he dipped in that case would be much poorer than the other?—No. I do not think there would be time for the separation to take place whilst he was dealing with the milk in that case.

210. Have you ever made experiments as to the different percentages of butter-fat in various positions in a railway churn after it had been standing for half an hour or an hour?—No, I have not.

211. So that personally you do not really know with regard to that?—No, I do not.

212. Then you say you can detect separated milk in new milk; what proportion of separated milk can you detect?—I am not prepared quite to state that at the moment. I should judge by the amount of the fat present and the amount of solids, not fat, and by the specific gravity, and by the ash. I should take a variety of data and draw my conclusions from those data.

213. I have no doubt you would be quite correct, but that is not what I am asking. You say you could discover any proportion that it was worth any one's while to put in. What do you consider it would be worth their while to put in—5, 10, or 15 per cent.?—Ten or 20 per cent., I dare say, it might be worth their while to put in.

214. Then if 10 parts of separated milk were added to 90 parts of real new milk, you can decide immediately upon the results of your analysis that that separated milk had been added?—Upon an assumed average; of course, I could not tell what the various cows were giving that provided that milk.

215. Then you could not tell that separated milk had been added?—I can tell in my chemical way.

216. That is, if you knew beforehand exactly the composition of the original milk, and 10 per cent. were taken from it and 10 per cent. of separated milk added to it, then you could find the separated milk?—Yes, certainly.

217. But if you did not know the composition of the original milk, you could not tell whether 10 per cent. of separated milk was in it or not?—No, of course not; I should not have the data before me to judge upon.

218. These samples all from one herd of 111 cows, as I understand, apparently were all taken in the afternoon?—Yes.

219. Can you tell us at what time of the year they were taken; in the first place, were they all taken at one time of the year?—They were all taken nearly about the same time; I am not quite sure, but I think it was at the beginning of the summer.

220. (*Chairman.*) Were they all taken on the same day, do you mean?—On two days.

221. Two consecutive days?—Yes.

222. That finished the herd?—Yes.

223. Was it in Birmingham?—It was at the sewage farm in Birmingham. I think they had 104 cows, and there were a few more from other dairies, making the 111 which I have laid before you.

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224. (*Mr. Barham.*) Now, turning back to Table 2, you suggest that the total solids should not be less than 12 per cent.?—Yes.

225. And that any sample of milk showing less than those solids should result, I presume—that is the only inference I can draw from it—in the prosecution of the person that sold it?—Yes, it is open to that. You are not obliged to prosecute because a milk falls a trifle below your standard, you know; you may make a certain allowance if you like.

226. Still, it is in the power of the Health Committee or of the analyst or of the inspector, as the case may be, to institute a prosecution?—Yes, to say whether or not they shall act rigidly on their own standard.

227. Supposing we fixed a standard, acting on your recommendation of 12 per cent., 15 per cent. of the samples of milk which you analysed from several cows would have brought their owners within the meshes of the law and rendered liable to conviction?—They certainly would not, because the other milks which would have been mixed with them would not contain less, but more than the standard requires.

228. Supposing the milk of each of these cows had been sold separately, it would have been so?—I should never think of prosecuting for 11·99 per cent. if 12 was my standard.

229. Then 12 would not be your standard—11·99 would then be your standard?—It is a matter of common sense, expediency, or discretion, or some other influencing motive.

230. If this Committee decide to fix a standard, you would still wish that analysts should have a discretion with regard to prosecuting?—I think they would be sure to exercise it; if the analyst did not, I think the Committee would under which he acted.

231. Supposing a farmer had entered into an arrangement to supply milk to a large town and supposing he went to the market to buy a number of cows, can you tell me any means by which he would make sure of not getting those 15 per cent. of your cows, supposing they were for sale?—Yes, because they always form the minority of living cows. Cows that yield a milk like that are the small minority.

232. What is to prevent the owner of those cows, after he had your analysis, sending them to market and selling them, so as not to run any risk of his good name?—He would never get such cows if he bought a number. If he bought a few cows he would buy a number whose milk was very much above the standard I speak of. He might buy one, perhaps, in some half-a dozen cows or ten cows which yielded milk below the standard.

233. I am afraid you do not quite follow me. Supposing this farmer of whom you had these samples of milk, when he discovered that 15 per cent. of his cows gave below your standard, had them sent to market for sale, is there anything to prevent another farmer who desired to set up with a herd of cows from buying them?—I do not know, I am sure. I do not think that cows come within the purview of my duties at all.

234. You speak of individual cows—are there individual cows in the villages of England where the milk is sold? For instance, the late Mr. Spurgeon used to keep two cows at Norwood, and used to sell the milk to his neighbours. Would you suggest that he should be prosecuted if the milk of those cows came below your standard of 12 per cent.?—No, I should not apply the same rule to individual cows as I should to dairies. I have already said that.

235. You have already told us that when an inspector brings you a sample of milk you do not know where it is obtained?—It would be for the milkman to prove that his cow does give such poor milk.

236. He would be liable to prosecution unless he does prove that?—Yes, but he would be able to free himself if he could prove by having cows milked in the presence of the proper authority that his cows did yield poor milk; he would then be exempted from the penalty.

237. True, but it would cost him probably £20 or £30 to prove his innocence?—Yes, and serve him right for not buying better cows.

238. Is there any outward sign on the cow by which he could detect the fact that it would give poor milk?—Not that I know of; there might be.

239. He would then have to incur an expense, say,

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of £20 or £30, to prove his innocence, and as a general rule the magistrates would not give the costs against the Town Council or the Vestry. That has been so in the past?—That depends upon the magistrate. I think many magistrates would give it against the Corporation. Benches of magistrates vary very much in their views of these questions.

240. Going on to Table 3, I find that if a standard of 3 per cent. of fatty solids were set up the owner's of 6·3 per cent. of the cows would have been liable to prosecution?—Yes.

241. And if a standard of, not 3·50 as you suggest, but of 3·20 only, of fatty solids were set up, then 11·7 of the owners would have been liable to prosecution? —Yes, then they would be saved, you see, by that 76 per cent. below.

242. I do not think so, unless they had the whole of the 111 cows. You said that first of all you would consider a herd?—Yes.

243. If any man owned five of those cows out of the 111 why would he not have the first five or six; then you see he would be liable to prosecution?—Yes, but I do not think it is at all likely.

244. Still, if he had those?—It is hardly a possible accident, I think.

245. What percentage of milks arriving at Birmingham Station direct from the farmer have you found adulterated? I suppose you could not remember?—I have not that fact down. You see it is not for me to enquire into these facts—they do not affect me in the least. A bottle of milk is brought to me sealed by the inspector, and with a number on it, and that is all I know about it—nothing more.

246. I think that the Health Committee of your town manage things exceedingly well when they take samples in the way you have described to us, because of course unless the milk is pure at its source it is impossible for it to be delivered pure afterwards, and it is better to stop it in the bulk?—Perfectly, but then those samples that are adulterated by the farmer are adulterated again by the retailers.

247. They may be, of course, and, whether they are or not, they are open to that. Turning to Table 4 (*see Appendix, No. I.*), and going back to the standard of 8·50 of solids not fat for the moment, because there you suggest 12 per cent. of total solids with 8·50 non-fatty solids and 3·50 of fat; if we took 8·50 of non-fatty solids, if that standard were set up, then, according to this Table, 21 per cent. of the cows would have rendered their owners liable to prosecution out of these 111 samples?—Yes, if you could isolate those particular cows; but that you never do in practice.

248. If they sell them it could?—No, it would never happen.

249. Then in Table 5 (*see Appendix, No. I.*) you give us a very important Table, and a very useful one, I am sure, but, working it out, it seems to me that if what is called the present standard of 3 per cent. of fatty solids and 8·50 per cent. of non-fatty solids were adopted hard and fast, 30 per cent. of the owners of prosecution?—Yes, if only one constituent be regarded.

250. That is rather a big percentage, is it not?—Yes.

251. (*Mr. Farmer.*) Does the Great Western Railway run into Birmingham?—Yes, it does.

252. Would you be surprised to hear that the Great Western has allowed the sealing of churns for the past twenty years, and that the South-Western Railway does the same—but that does not run into Birmingham?—Then I presume that our inspector never buys from the Great Western. I have always been told they are not locked.

253. I can only say they allow it; but, of course, it does not follow that it is actually done?—What I have always heard is that the railway companies will not allow it. Most of the milk comes into Birmingham by the London and North-Western and Midland.*

254. (*Mr. Murphy.*) From which counties do you receive milk into Birmingham?—I should think from Staffordshire principally.

255. And Warwickshire, I take it?—Warwickshire, no doubt, because we are in Warwickshire, but we get a great deal from Staffordshire, from the neighbourhood of Tamworth and that direction, also from Worcestershire, some from Derbyshire, and a little from Gloucestershire.

256. Do you know, as a public analyst, what counties your samples come from?—No.

257. So you are not able to compare the milk that comes from different counties?—No. I only know the milk by a number, as you would know a soldier or a convict.

258. I think you said your standard might be applied all the year round without injustice?—I think it might without hardship or injustice.

259. Have you any experience of milk from the Birmingham cow-sheds?—No direct experience except that dairy I quoted to you in which the cows are badly fed and yet which yielded 12·68 of total solids—the lowest I ever knew from a diary. That was a cow-shed in Birmingham, and there were several others too at the same time which gave a good milk, and a very good milk.

260. You have no reason to think there is any material difference between the quality of the milk from the Birmingham cow sheds and the quality of the milk obtained from the farmers in Staffordshire?—I have not found it except in the one case of the sewage farm, where the milk gave 13 per cent. of total solids. We used to get a halfpenny a gallon more for the milk sold at the sewage farm than any other farmers could get.

261. In reply to Mr. Barham you were saying that certain cows which you indicated in your Table would supply milk of a lower quality than the standard you mentioned?—Yes.

262. Do you think that in the ordinary course of trade a man trying to conduct his business on honest lines would be likely to get a group of cows giving milk below the standard?—No; I am quite sure it is impossible.

263. So that your standard would be a perfectly easy one to maintain for any milk that is mixed?—Certainly, because I maintain that few milks fall below that standard (and fall a little below it), while a great many milks are above it, and a great deal above it, so that they more than counterbalance the few deficient samples.

264. So that a man would have to depart from the ordinary course of trade if his cows, as a whole, gave milk of a lower quality?—He would be quite safe.

265. You would propose to have a different standard if the milk was taken from a single cow?—I would not take any standard—I would be guided by the cow. If a man sells milk from a single cow and is prosecuted he has simply got to say, "Here is my cow, come and milk it when you like, milk it in your own way, and analyse it. If your results condemn me I will submit, but I think you will find that that cow gives a peculiar milk." Then that man will be exempt from penalty.

266. I gather that the Health Committee of the Birmingham Town Council decide whether there shall be a prosecution?—Yes, they do.

267. Is that the intention of the Act, or is it the intention of the Act that the purchaser shall decide?—I never heard what the intention of the Act was.

268. You are not able to answer that question?—No.

269. Of course, the Birmingham Town Council appoint the purchaser, that is the inspector?—They appoint the inspector and they appoint the analyst too.

270. The inspector is the purchaser under the Act? —Yes.

271. You are not able to say whether the discretion as to whether there is to be a prosecution or not upon the public analyst's certificate is vested by the Act either in the purchaser or in the committee who appoints him?—I do not know what the Act says, but the committee does decide, that is all I know.

272. When you give a certificate under the Act do you state what the constitution of the milk is?—I give the percentage of the milk—fat, solids not fat, water, total, and then state what my opinion is deduced from those facts.

273. As to the conclusions to be drawn as to whether the milk is adulterated, you mean?—Yes, I say I am of

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* The witness subsequently wrote: "On enquiry I am informed that locking is allowed if the contents of the churn are marked on the outside, which they appear never to be, but only inside."

opinion that this milk contains 20 per cent. of water more than natural or 12 per cent. of water more than natural, as the case may be, or so much fat less than natural. That is the remark I make after giving the analytical results.

274. If the committee who deal with this matter had before them the fact that this sample was milked from a particular cow, do you think it would be in their discretion altogether as to whether it should proceed to a prosecution?—They are not a judicial body, of course, but they would have the power of saying this man says his cow gives a poor milk, we have had that cow examined, and find it is so, and we will not prosecute. They might do that.

275. Private individuals might take proceedings?—That is so.

276. But it is not done as a matter of practice, is it?—They cannot prosecute because they never comply with the requirements of the Act; they take in their morning's milk, and they put some in a bottle and send it down to the analyst.

277. That is from want of knowledge?—That is the effect of it. They receive my certificate, and then say they will prosecute the man: "It is a rascally thing to water my milk." I say: "You cannot, you did not tell him you were going to have it analysed; you did not give him a portion of the sample; you did not comply with any of the requirements of the Act, but if you like we will buy a sample for you and have it analysed, at least, the inspector will buy it for you."

278. If the private individual had gone to work properly, he could institute proceedings?—Certainly, but I do not think they ever do so.

279. Do you think it would be a sufficient defence if the fact came out before the magistrate that the milk came from a single cow, the milk of which was found to be somewhat below the standard?—The magistrate must authorise somebody to see the cow milked, and have another analysis made, and more evidence brought before he could decide the case.

280. I want to know whether there is or is not a sufficient safeguard against a prosecution which would be undesirable if the milk of a particular cow came below your standard, and the vendor of that cow's milk were prosecuted?—That is the only safeguard—appealing to the cow. But it might turn out the man had produced bad milk by bad food or other bad conditions, then he should not be exempt from blame, even though the cow yielded bad milk. If his mode of keeping the cow led to the bad milk, then the blame would be his, because, in my opinion, he would be adulterating the milk before it came from the cow instead of after.

281. Have you gone into the question of adulteration in the case of particular cows?—No, I have not gone into it.

282. You are not prepared to say whether or not they have been properly fed?—If the cow is not properly fed it gets emaciated and it gets weak; there are evidences of ill-health.

283. You are not prepared to say that these cows which are giving milk of a quality below that of your standard are cows in such a condition and so poor that their milk ought not to have been sold?—No; all I am in a position to say is that they form a very small minority of the cows which constitute a dairy, and, therefore, they do not interfere with the standard which I have been insisting upon.

284. (*Chairman.*) In connection with the last point, were these 15 per cent. of cows giving what I may call almost an abnormal milk (very low in quality) all in the same herd as the rest you examined on the sewage farm?—Yes.

285. They were not ill-fed or half starved?—No; I cannot say they were not ill though.

286. You do not know what was the reason for their giving such milk?—No, I do not know what their condition was.

287. I was thinking of the people who owned this herd, when they found they had got 15 per cent. of their cows giving this bad milk?—They would not find it, they would not know.

288. Would they not?—No, it was I who found it out.

289. But it is their milk?—They would go on milking and mixing all the milk together and producing a splendid average—all the 15 per cent.

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290. I think if I had a chance of knowing myself that I had fifteen cows out of 100 that were giving a low percentage of milk I would draft them out and sell them?—No doubt one would.

291. Then, of course, Mr. Barham's point arises. Somebody going into the market wanting to start a herd of cows would buy those, and he would be getting but very poor milk?—Such cows are generally sold for turning into beef, not for milk.

292. You were saying that you think if a single cow with poor milk is ill-fed and half-starved that milk ought to be considered adulterated?—Yes.

293. Therefore, if that man with the single cow is subjected to this inspection and has proved that his cow has given that milk, would you recommend that milk should be treated as adulterated?—I think he is bound to prove his statement.

294. The usual idea is that a man is innocent until the contrary is proved; it is rather a difficult thing for us to recommend, is it not, that that man should be prosecuted?—The case is so unlikely to happen that I do not think it requires to be dwelt upon.

295. Not in Birmingham, but it might be in outside districts; we have got to watch over the whole country?—There must be a special enquiry into the case in an instance of that kind.

296. Supposing the Committee recommends that the law should be altered on your recommendation so as to make 12 per cent. of total solids, and 3·5 per cent. of fat the minimum, what do you think the effect on the milk trade of the country would be?—The effect on the milk trade of the country would be in the first place that they would supply a good article instead of a bad one, and to cover themselves from loss they might raise the price of their milk. I do not see why they should lower the price of the milk beyond what they can honestly sell genuine milk at. I do not want to pay 3d. a quart for my milk if I ought to pay 3½d. or 4d.

297. You think it will raise the quality of the milk?—It would raise the tone of the farmer, it would raise the quality of the milk, and it would be to the advantage of the consumer.

298. What effect would it have on the milks which are richer than those which you are describing; would they be watered down or would separated milk be added so as to bring them down to the standard?—Possibly it might be so.

299. Most likely it would?—They are very wily, and they would do it. They do it now, indeed, and would do it then, but then in Birmingham we should keep them up to the mark by raising the standard.

300. Do your inspectors inspect the milk from retailers as much as they do from purveyors at the railway stations?—Yes, they purchase from both.

301. Are there as many inspections made away from the railway stations as at the railway stations?—Many more.

302. Many more?—Yes; one purveyor may ultimately supply through the medium of middlemen thirty, forty, or fifty retailers.

303. Do you know what part of the churn your inspectors take the sample from?—The whole of it. He pours the whole contents of the churn into an empty churn, and then pours the whole contents back again, by which it is fair to presume that the mixture is complete, because, after all, the separation is very imperfect to begin with in a shaking railway journey; there is not much separation in a journey of an hour or say an hour and a-half.

304. He just tips it out from one churn into another?—He pours it all out, sixteen or seventeen gallons perhaps, and pours it back again.

305. He takes a sample from that?—Yes, from the original churn.

306. I take it that your sample from the churn is a fair average sample?—It is perfectly well mixed.

307. (*Professor Thorpe.*) These tables which you have been referring to, you submit to the Committee and hand in?—Yes, certainly. (*See Appendices Nos. I. and II.*)

308. There is one other question that has arisen out of your cross-examination: Does what is called the refrigeration of the milk modify in any way the ease with which the separation of the fat takes place?—I could not say.

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309. You have told us that the volume in a churn is about sixteen or seventeen gallons?—That is about a full churn, I should think.

310. With the degree of separation which you have alluded to—that relatively small separation which takes place in transit—would the effect of a railway guard dipping his can, holding, you say, at most a quart, into a churn of seventeen gallons really affect the question of the amount of fat shown on analysis?—No, it would not.

311. (*Dr. Voelcker.*) On that same point it would affect the milk, however, if a railway porter or guard took a quantity of milk out and then added water to make it up to the same level, so that a certain fixed quantity should be delivered to the retailer, then it would make a considerable difference?—Certainly.

312. Did I understand you to say that if it came to a question of a reference to an individual cow, you would allow the farmer to milk the cow out in his own way?—No, I should have it milked under proper inspection certainly.

313. Because, if not, he could produce a certain milk?—Certainly.

314. (*Mr. Barham.*) Referring to the cow, and your replies to Dr. Murphy, supposing a sample had reached the public analyst showing less than the standard, it would be a very easy matter to refer to the one cow or to the two cows, as the case might be?—Yes.

315. I thought you also said that you did not know whether the milk was obtained from one cow or from a number, and that the Health Committee, who decide these prosecutions, would not have that information before them?—No, they would not.

316. Then it would take at least a month, would it not, between the time when the original sample was taken and the time when the appeal to the cow was made?—Yes.

317. It usually would do so in the ordinary course?—Yes.

318. Do you not think the conditions of the food, of the season, of the temperature, of the lactation, and whether it be the morning's or the evening's milk would materially affect the milk of the cow when comparing it with the sample previously taken?—I should think all those varying conditions ought to tend to compensate each other very largely.

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Dr. BERNARD DYER, called; and Examined.

319. (*Professor Thorpe.*) You are a Doctor of Science of the University of London and a Fellow of the Institute of Chemistry, I believe?—I am.

320. You are also a Public Analyst under the Sale of Food and Drugs Acts for the Counties of Leicester, Rutland, and Wilts, and for the City of Truro?—Yes.

321. You are also District Agricultural Analyst for several counties, and you have been for many years Consulting Chemist to the Essex, Leicester, and Devon Agricultural Societies?—Yes, that is so.

322. You have had considerable experience in milk analysis?—I have.

323. Extending over what length of time?—Nearly twenty-five years.

324. You have also acted for many years as one of the Honorary Secretaries and for two years you have been President of the Society of Public Analysts?—Yes, that is so.

325. As a consequence of all these appointments you have necessarily given a good deal of attention to the subject of milk analysis?—Quite so.

326. And to the consideration of the standards necessary for the guidance of public analysts in their duty of protecting the public against adulteration?—Yes.

327. You also, in your capacity as consulting chemist to various agricultural societies, would have to study the question a good deal from the standpoint of the farmer?—Yes, I have.

328. Perhaps you would kindly state to the Committee what you have to state with respect to the questions which have been remitted to us?—First, with regard to the existing state of things. For a number of years past, in fact ever since accurate methods have been devised and adopted for milk analysis, public analysts have taken as the limit below which milk should not be recognised as being of the nature, substance, and quality demanded, 8·5 per cent. of non-fatty solids and 3 per cent. of fat.

329. May I ask you how those limits have been arrived at?—Those limits have been arrived at by collecting the experience of individual analysts generally throughout the country.

330. Has there been anything of the nature of an official act through the Society of Public Analysts as to the adoption of those standards; how have they become binding—that is what I want to get at—upon the public analysts as a body?—Of course, they are not binding except in a virtual sense, but these figures have become fixed by a resolution of the Society of Public Analysts, acting on enquiries which the Council has held, and on evidence which has been brought before it.

331. To that extent they are official numbers?—Yes, to that extent they are official, as far as the Society of Public Analysts can be regarded as having an official existence.

332. I gather, then, that the general body of the Society of Public Analysts have agreed to take these limits as practicable limits to work upon in advising whether the presumption of adulteration may be raised?—Yes, that is so. I think I ought to explain, at this juncture, that I am here to-day only to give my personal views. The Society of Public Analysts has been invited by your Committee to send an official represetative, who will probably be our president, to express the views of the society, and the Council has not yet formally met to consider the matter. Therefore, what I am saying to-day must not in any way be taken as coming officially from the Society of Public Analysts. I am stating historical facts, and my own views, but not necessarily the views of the society.

333. I think we all know that, because, of course, the Committee has specially invited the society as a society to express an opinion. What I wanted to get from you was the particular method by which these limits of 3 per cent. of fat and 8½ per cent. of non-fatty solids have been generally adopted by the body of public analysts?—On the official recommendation of the Council of the society.

334. (*Chairman.*) Who fixed the Somerset House 2·75 which I see constantly referred to in cases before the magistrates?—I suppose Professor Thorpe's predecessor, Dr. Bell.

335. Whenever I see a case in the paper I always look at it, and I find they refer to the Somerset House standard, not to the one you refer to—that is, they take 2·75 as their limit of fat?—Some may, as individuals, adopt that limit, but the Society of Public Analysts has never countenanced it. We have always maintained that the limit adopted at the Government Laboratory was too low. I am informed that Professor Thorpe has officially issued a document to the effect that, in view of certain circumstances, he has come to the conclusion that at the present time, at any rate, the 2·75 limit is too low, and that the limit now adopted is 3 per cent., which is the same as that of the Society of Public Analysts. I believe the Somerset House standard, as it is called, is now 3; I have been informed that is so, but not officially by Professor Thorpe—I have seen it in the public prints that that is so.

336. (*Professor Thorpe.*) There is no official declaration, and never has been; Somerset House has not the power to make any official declaration on the matter, although it is a fact, and has been for some months past, that we do adopt this limit of 3 per cent. and 8·5 per cent. There has been no official declaration, and there has been nothing in the nature of a circular sent out?—I saw a statement in a public print, the name of which need not be referred to, to that effect.

337. (*Chairman.*) I am only asking you for your own views, because I see so many people have acted on this particular standard, and it fills everybody, naturally, with, what shall I say, pleasure, to find that there is a standard of some sort, and that 2·75 has been taken in cases by analysts?—Perhaps I may explain that by saying that some analysts have not perhaps had the full courage of their own convictions, and they have had a natural hesitation to come in conflict with higher powers. To avoid conflict, and for the sake of peace and quietness, some

of them as individuals might adopt 2·75 during the time that 2·75 was the standard recognised at the Government Laboratory. In that sense 2·75 may have been taken by some as a standard, but only in that limited sense.

338. (*Professor Thorpe.*) Perhaps you will now proceed with your general statement?—Occasionally, naturally, milk falls below this limit of 8·5 and 3 per cent., but this is, I think, well recognised to be in most cases due to abnormality in individual cows, except in the case of certain breeds, such as Dutch cows, which, even in herds, will sometimes give milk below these limits. Dutch cows, of course, are valuable to the dairyman on account of the large volume of milk they give, although its quality is poor. A Dutch cow may during the week produce more milk constituents than a Shorthorn cow, but she dilutes them more.

339. Do you know if one effect of the operation of the Food and Drugs Act has been gradually to eliminate these cows which produce large volumes of milk of a poor quality?—Yes, I think the operation of the Act has been to diminish the number of those cows.

340. Does such a Dutch cow play any considerable part, therefore, in the milk supply of this country?—There are still herds of Dutch cows. There is one rather well-known herd somewhere in Cheshire, I think, the milk of which has given some startling results; but those are not within my personal experience.

341. There is a herd of them there?—Yes. Mr. Smetham, of Liverpool, published the results of analyses actually of a herd of Dutch cows; but it is very rare indeed that a herd of Dutch cows exists; I cannot say that I know at present of any other.

342. Do you think that the general character of the milk supply of this country is at all affected by Dutch cows?—It is influenced by the presence of Dutch cows in mixed herds.

343. But is it materially affected?—Yes, I would even say materially affected. The Dutch cows are now, as far as I can learn, rarely kept by milk producers without a judicious admixture of Shorthorns or other breeds, the richness of whose milk balances the poverty of that of the Dutch cows; but still the milk will necessarily be poorer than if there were no Dutch cows present in the herd.

344. (*Chairman.*) Is that in any one particular part of the country?—In Essex there are a large number of Dutch cows. It is much more common now to keep in place of Dutch cows cows bred from a Dutch cow and a Shorthorn bull. Those cows are very common. While the Dutch cows are chiefly valuable for the great quantity of their milk, the Shorthorns, on the other hand, produce the richer milk; and by this cross animals are obtained which happily combine the free milking of the Dutch cow with the richer quality yielded by the Shorthorns.

345. (*Professor Thorpe.*) If this Committee recommended a relatively high standard, I suppose the effect of that would be to still further curtail the use of the Dutch cows?—Yes. I have no doubt that would be the gradual effect.

346. To that extent it would affect the quantity of milk given by each cow?—Yes, that would be so also. If the quality is raised I think the quantity would be to some extent diminished. My view is that the limits of 8·5 and 3 per cent. work well in practice. Properly used they inflict no injustice on the milk producer or the milk seller, and they serve to protect the public, I will not say against adulteration, but against excessive adulteration. I say excessive adulteration advisedly, for there is no doubt that both limits are low, having regard to the average quality of milk. The 8·5 limit for non-fatty solids allows of the undetected addition of a small quantity of water to milk of the quality which probably constitutes a greater proportion of the milk supply in England; while, on the other hand, the limit of 3 per cent. for fat is low enough to tempt the producer or dealer to remove fat or—which is the same thing, of course—to add separated milk. I think that in nine cases out of ten a 3·5 limit would probably be much more fair to the consumer; but exceptional seasons and exceptional circumstances cannot be overlooked or the fact that it is very frequently the case that the produce retailed is that of a few cows only. This is chiefly in country districts. In large towns the milk is usually the milk of herds or the blended produce of many cows.

347. You have, I understand, made a great number of analyses of milk, and you have collated those for the use of the Committee?—Yes. I have been during the last few days somewhat hurriedly through my laboratory notes for the last five years. I had not time to go back further.

348. How many milk analyses does that represent?—I have referred to 575 samples.

349. How have those been gathered?—These are analyses of samples that have been submitted to me by inspectors for the most part from the counties for which I act, and they include a considerable number of samples sent by farmers from miscellaneous sources; but these do not include any of the samples which I have thought it my duty to return as adulterated. The analyses that I gave in my *précis* are those samples which were either regarded as genuine on the 8·5 and 3 per cent. standard, or for some other reason they were passed as being either probably or very possibly genuine.

350. With those samples upon which action was taken by the local authority in the way of prosecutions, upon what limits were those prosecutions initiated?—Those prosecutions were initiated on the 8·5 per cent. and the 3 per cent. I take it that my view as to the adulteration was endorsed by the fact that in none of these cases was my decision as to the adulteration challenged—I do not recollect any case at all.

351. Were there any cases which you returned to the local authority as in your opinion adulterated on which no action was taken?—Yes, there would be cases occasionally in which the Chief Constable or the committee or whoever might have to deal with the case, might decide that the adulteration or the fat removal or fat deficiency not being very great, the matter might be dealt with by a caution; but in none of those cases has it been reported to me that in response to the caution the man denied the offence.

352. These samples that were received from your inspectors were, of course, for the most part from such counties as Wilts, Leicester, Rutland, and the city of Truro?—They were from Wiltshire and Leicestershire chiefly.

353. Would any of those possibly be the milk of individual cows?—I should think a great many of them would be.

354. They would?—Perhaps not of one, but of one or two or three. Many of them would be the milk sold in small villages about the country. I have classed all the samples that were passed as "normal" and as "abnormal" or "doubtful" samples. By "normal" I here mean simply up to or above the limits of 8·5 per cent. of non-fatty solids and 3 per cent. of fat—not necessarily genuine. I use the word normal in that restricted sense. Under the head of abnormal or doubtful samples, I mean those samples of poor quality which gave more or less evidence of abnormal constitution, and which, although below the limits, were, for what appeared to be some valid reason, passed as possibly genuine; sometimes, for instance, merely on account of the smallness of the deficiency of non-fatty solids, in presence of a decidedly high proportion of fat; sometimes merely on account of the triviality of the deficiency observed; sometimes owing to information that the milk was the produce of but one or few cows. But it is quite possible that some of these samples which I called abnormal or doubtful were adulterated. At any rate, here I keep them separate. The normal samples are 517 in number. Of these, 267 were from Leicestershire and Rutland. These averaged 8·91 per cent. of non-fatty solids and 3·63 per cent. of fat or 12·54 per cent. of total solids. 131 were from Wiltshire, and averaged 8·67 per cent. of non-fatty solids and 3·62 per cent. of fat, or 12·29 per cent. of total solids. The rest were of miscellaneous origin. Taking the 517 samples which passed the limits adopted by public analysts (and as I understand now also adopted in the Government Laboratory), for genuine milk, the average figures were 8·86 per cent. of non-fatty solids and 3·64 per cent. of fat, or 12·5 per cent. of total solids. The abnormal, or doubtful samples during the same period were 58 in number, making nearly 10 per cent. of the total number "passed," excluding altogether the samples returned as adulterated. Of these 58 samples 12 were below the limits for both fat and non-fatty solids. The remainder were deficient only in one or the other. But in the great majority of these cases the samples were such as to run no serious risk of condemnation by an analyst of experience who brought an average amount of common sense into the consideration of his results. I will first consider the samples that were below the 8·5 limit for non-fatty solids. Of these, 25 samples—that is nearly half the number—were below 8·5, but not below 8·4; 17 were below 8, but not below 8·3; 12 were below 8·3, but not below 8·2; and one was 8·16.

355. Do you happen to have the details of these

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numbers with you, because I should like to know, if I could, what were the considerations which led you to suppose that of the number you told us certain of these might still be regarded as genuine, although, perhaps, in some respects abnormal?—I have not the details with me. The usual evidence of abnormality was the highness of the percentage in ash in proportion to solids, the percentage of ash in some of these low milks being often considerably higher than that often found in rich milk.

356. You are guided solely by the fact that it would contain, say, 0·7 per cent. or more of ash?—Something above 0·7.

357. The ash surpassed that limit?—Yes. It was higher, as a rule, than the ash found in average milk or as high. In proportion to the solid matter present the ash was high. Probably in most of these cases the presence of the high ash in the absence of borax—where the case is one in which I shall have to take the initiative—would be sufficient to let a sample pass; but of course if one were going into the matter more critically it would be very important to determine the proteids as well as the ash. In the thirty cases falling below the 8·4 there was generally evidence of distinct abnormality, inasmuch as the percentage of ash was high in proportion to the solids. In some few cases, however, the samples were merely passed as doubtful on the ground that the ash was high enough to be, at any rate, consistent with genuineness, while the fat was satisfactory in quantity. I have put these samples in my *précis* to illustrate how the present limits work. They are the sort of cases that one has to face and show the principles on which one has to deal with them. Fifteen samples were below the recognised limit for fat; of these six were below 3 per cent., but not below 2·9; five were below 2·9, but not below 2·8; and four were below 2·8, but not below 2·7. Now, of these fifteen samples twelve were included among the samples deficient also in non-fatty solids, but were either abnormal or, for some reason which appeared valid, were treated as merely doubtful. For instance, I sometimes got information from an inspector that the milk was the milk of a small man, who had only one or two cows. That has happened sometimes. It has also happened that some of these cases have occurred during extremely droughty weather. I have to come to that question presently. The cases that I have mentioned are cases in which I consider that there was some reason for the case being viewed without strict arithmetical reference to the ordinary standard.

358. Then I see you summarise the whole of the 575 samples?—Yes; 520, or 90·4 per cent. gave 8·5 per cent., or over, of non-fatty solids; and 25 samples, or 4·3 per cent., gave 8·4 per cent., though not 8·5; 17, or 3 per cent. gave 8·3, though not 8·4; and 13, or 2·3 per cent., gave from 8·16 to 8·3. As regards fat, 560, or 97·4 per cent. gave 3 per cent. of fat or over; 6, or 1 per cent., gave 2·9 per cent., though not 3; 5, or 0·9 per cent., gave 2·8 per cent., though not 2·9; and 4, or 0·7 per cent., gave 2·7, though not 2·8. I have already pointed out that abnormality such as was observed in most of the low samples was chiefly found in ash. Then I would like to point out, though doubtless it will be brought before the Committee otherwise, that Dr. Vieth has shown that in normal milk there is a fairly constant ratio between the milk-sugar, the proteids, and the ash, viz., milk-sugar is to proteids as to ash as 13 to 9 to 2, and any appreciable departure from this may be taken to indicate abnormality.

359. Was it this ratio that you acted upon?—No. In some of these cases, but I have not the notes of which, it has been taken into account, but in most cases the ash was the sole factor.

360. Was it the absolute amount of ash or its ratio to something else?—It was the ratio of the ash to the total solids, or rather to the solids not fat.

361. Then it is really the ratio of 2 to 22?—Yes. When a milk is abnormal it is usually deficient in milk-sugar, and that raises the percentage of proteids and the percentage of ash. Thus included among the normal samples is a series of 30 samples, which illustrate the variations met with in one season in the mixed milk of from 70 to 80 cows, largely Shorthorns, but including a number of crosses between Shorthorns and Dutch and Ayrshires, and possibly one or two Dutch cows also, but I am not sure about that. Fourteen samples of evening milk averaged 8·85 per cent. of non-fatty solids, and 3·91 per cent. of fat. The individual samples—that does not mean samples of individual cows; the samples in each case were of the whole herd—the individual samples varied from 8·4 to 9·13 per cent. in non-fatty solids, and from 3·44 to 5·07 in fat. Sixteen samples of morning milk averaged 8·69 per cent. of non-fatty solids and 3·48 per cent. of fat. The individual samples varied from 8·53 to 9·02 in non-fatty solids, and from 3·20 to 4·15 per cent. in fat. This was in a season of drought.

362. (*Chairman.*) What does a season mean—how many months?—This would be in the spring and summer.

363. Would it take you over as much as six months?—I doubt if they extended over as long as six months. I should probably think three or four months, but I have not noted the dates, though I might easily have done so. I am speaking from memory; I should think they might be said to have occurred between three and four months during spring and summer, probably in the late spring and summer, and it was in a season of drought. Some instances occurred shortly before this series of analyses was made in which in the morning milk the fat fell to 3 per cent., and once—I have been unable to find the exact record, though I made the analysis—the milk fell nearly as low as 2·9 per cent. The cows were liberally fed with concentrated food, in addition to mangolds and grains, and on certain occasions during that season the farmer was warned by the dealers who took his milk that its quality as checked by their analyst was perilously near the recognised limits for both fat and non-fatty solids—that means perilously near the 8·5 per cent. and 3 per cent. This illustrates that it is very difficult in exceptional seasons, and in times of hot, dry weather, even with artificial food, to maintain a high standard uniformly, and for this reason I think that the fixing of a higher standard than 8·5 and 3 would from time to time lead to the undue vexation of even the keepers of large herds of good cows. It would not usually do so, but I believe that it would occasionally do so, and it would be still more likely to press hardly on those who had few animals. If it were not for exceptional seasons I think the limit might well be raised to 12 per cent. of total solids, of which at least 3·25 should be fat.

364. (*Professor Thorpe.*) But, still, with respect to that point, of course, it is open to the person aggrieved to show that that was the case?—Certainly.

365. We only raise the presumption for him to clear the imputation?—Yes, and if the matter could be so worked that he is given his opportunity of clearing himself, so to speak, before being brought to answer a charge before the magistrates, the case would be very much easier to deal with. Even in an exceptional season with a farmer, such as the farmer to whom I have been referring here, if a man in his position were brought before a magistrate charged with skimming his milk, even though he succeeded in showing that it was due to abnormal circumstances and an abnormal season and so forth, it is still a serious matter. On the whole, my personal view is that for these reasons we should be content to take the moderate figures which have hitherto prevailed. There is one other point. When milk is rich in fat it usually happens that it is also rich in non-fatty solids; but this is not always the case, and the fat is a much more variable figure than the non-fatty solids. If the non-fatty solids produced by the cow remain constant while the fat is increased, the increase in fat leads to a slight depression in the percentage of non-fatty solids. For instance, if milk containing 8·5 per cent. of non-fatty solids and 3·5 per cent. of fat became enriched to 4·5 per cent. of fat, the 8·5 per cent. of non-fatty solids would be contained, not in 100 parts of milk, but in 101, and would be therefore lowered as percentage to nearly 8·41. This was pointed out a good many years ago, first, I think, by the late Mr. Heisch, and subsequently by other analysts, including, I think, Mr. Estcourt; and it has been contended that the non-fatty solids should be estimated on the basis of the fat-free milk. This would be more rational, but it would introduce apparent difficulties of calculation in the eyes of magistrates and other laymen, and I think the case might be sufficiently well met by simply arranging that when the percentage of fat rose above, say, 3·5—not merely above the minimum limit but above the 3·5—a deduction might be made from the 8·5 limit in the proportion of 0·05 for every 0·5 per cent. of fat in excess of that figure. Or somewhat the same thing might perhaps be more conveniently done in another way. An alternative limit might be fixed, as, for instance, to the effect that when milk contained 12·5 per cent. of total solids, including not less than 4 per cent. of fat, no presumption should be raised against its genuineness on the ground of deficiency in non-fatty solids. Some alternative standard might be fixed on that principle.

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366. (*Chairman.*) Have you anything to say to us about cream and condensed milk?—I am afraid I have no views on the subject of cream; I have not really thought much about the question. It seems to me that the quantity of fat to be expected in cream must depend very largely on whether it is cream skimmed by hand-skimming from a shallow pan on the one hand, or whether it is separated cream or clotted cream on the other. Where the line is to be drawn I really do not know.

367. Have you had submitted to you for analysis any samples of cream?—From time to time, but I have no notes of the results. There will probably be witnesses before the Committee better able to deal with this question than myself.

368. Can you tell us anything about condensed milk?—With regard to condensed milk it occurs to me that probably the best way of fixing a fat standard for condensed milk would be to decide that condensed milk ought to contain at least as much fat as it contains of proteids. If 3·5 was taken as the average proportion of proteids in good milk—and it is probably about that—that would be equivalent to 3·5 standard for fat, that is to say condensed milk should be made from whole milk not having less than 3½ per cent. of fat. That is what it would resolve itself into, but I would say a quantity of fat equal to the proteids contained in it. Of course, a maker of condensed milk has a selective power over the milk that he uses; he is not compelled to buy or to use poor milk, and he can very well take precautions to see that the milk he gets and uses for condensing is milk of a good quality. I think practically that would be an easy way of arriving at the standard.

369. Why do you think the maker of condensed milk should start with a richer milk than you think should be the average in the country generally?—I do not think that the general inhabitants of the country should have milk with so small a quantity of fat as 3 per cent., though 3 per cent. might be, I think, very well made or continued as the limit. Obviously a manufactured article like condensed milk is much more under control than the milk supplied by an ordinary milkman.

370. In fact, you would put a higher limit for condensed milk than you do for the general milk of the country?—Yes. Of course, the degree of concentration, the proportion of sugar added, and so forth, in condensed milk are variable, and therefore I think it would be difficult to say that condensed milk should contain 11 per cent. of fat, say (which good condensed milk very commonly does contain), because an alteration in the proportion of sugar or in the degree of concentration, might make a difference; but if it were fixed as being the same quantity as the quantity of proteids present that would be, from an analyst's point of view, a very practical kind of standard, because proteids are very easily determined—and that is easily determined.

371. (*Dr. Voelcker.*) When you use the term abnormal, I take it you include under that not only milk from cows that are not in good health or that are badly fed, but also milk which has been adulterated, either by the addition of water or by skimming, or by the addition of separated milk?—I think I defined what I meant by abnormal or doubtful. I meant samples of poor quality, which gave more or less evidence of abnormal constitution for the most part; but I did include under that heading some doubtful samples that might possibly have been adulterated—the samples which there was some reason for giving the benefit of the doubt to.

372. Do you consider it is desirable or possible to make separate standards for the milk of a herd of cows and for individual cows?—I do not think it would be practicable in working, but I think it might be possible to make a standard for towns and a standard for the country. That might be possible.

373. In fixing, as this Committee is trying to do, a standard, which, in your view, is the more correct one to take—the composition of the milk of the herd or of the individual cows?—The composition of mixed milk certainly, because the mixed milk is the average of the individual cows. If you were to take milk that might possibly be yielded by an individual cow you at last come to a standard so ridiculously low that it would be of no use whatever.

374. Then you would agree that if you were to legislate on the basis of milk yielded by individual cows, although it might be shown that those cows were in good health, and ordinarily well fed, harm might be done to the consumer by giving to him too low a quality of milk?—I am sorry, but I am afraid I did not quite clearly grasp the question.

375. If you were to fix a standard based upon exceptional cases of the quality of a milk yielded by individual cows, such as we have had in evidence from Dr. Hill's figures, you might do an injustice to the consumer by fixing an unnecessarily low figure?—A very great injustice obviously.

376. And it would be fairer and better for the country generally—the farming industry as well as the public—that you should take as a standard the milk produced by herds of cows of good class cattle?—Yes, but with a little discount to allow for the individual cases.

377. It would be fairer to take as your standard the figures yielded by the great proportion of herds than by individual cows?—On the whole it would be fairer, but not in all cases fairer. I am afraid there would be too many exceptions.

378. Do you mean seriously to say that the quality of milk produced in our English farms is materially affected by the introduction of Dutch cows?—I think it is still materially affected in some parts of the country, but not over the greater part of the country, and it is less affected than it used to be.

379. You have no idea of the percentage of Dutch herds?—No.

380. Nor of the percentage of dairies in which Dutch cows form a material part?—No; but I believe from general conversation that I have had with Essex farmers that Dutch cows exist still to a large extent in Essex.

381. Is it not rather the fact that they are dotted about here and here?—I really cannot give you anything but my general impressions, which I have given you.

382. Is the result of introducing the Dutch cows that there has not been any increase, but rather a decrease, I suggest, in the amount of Dutch cows in the country as an element in our dairies?—I think the Dutch element now exists less in the Dutch cow than in the offspring of the Dutch cow.

385. I happen to know the particular dairy in Cheshire to which you refer; it belongs to Lord Egerton of Tatton. Is it not a fact that that was introduced more as a fancy than anything else?—I do not know.

386. I can tell you about that now; as a matter of fact only the crosses are used for sending milk into the towns?—That is gratifying to hear.

387. Is it not a much more frequent thing to have the introduction of the Jersey cow in a milking herd, and if you take the length and breadth of the country do you not much more frequently see Jerseys sprinkled here and there, and a cross between a Shorthorn and a Jersey than you would an introduction of the Dutch element?—I do not think Jerseys exist to a large extent in the herds of the farmers who send milk up to London.

388. Is it a wise thing to legislate for exceptional things like the Dutch cows, and would not the effects of the standard based on the interference produced by them be to give facilities to other people to produce inferior milk?—Most certainly; if you were to base a standard on Dutch cows altogether you would get an exceedingly improperly low standard. I only cite the existence of Dutch cows, and of their offspring as a reason which occurs to me for making it impracticable to make the standard unduly high.

389. Do you agree that an analyst cannot discriminate in fixing a standard of reference—that it will not do for him practically to discriminate between morning and evening milk, and the early and late time of the year—it is impracticable, I mean?—It is impracticable; the morning milk is always poorer.

390. In fact you do not think it advisable to fix standards for the time of day, or the part of the year?—That is absolutely impracticable.

391. Is it not the fact that as the presumed standard has gone up there has been no more difficulty in regard to the producer giving milk of that quality. We have it that the standard is popularly believed to have been raised; is there any more difficulty now in meeting the demands of that standard than there was before?—I do not know that I am exactly in a position to answer that question.

392. (*Professor Thorpe.*) Perhaps you might answer it

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in this form. Are the cases that have been brought into court from your knowledge as a public analyst more numerous, and are the convictions more numerous?—My impression is that they are.

393. (*Chairman.*) For what reason you cannot say? It may not be the question of the difficulty of meeting the higher standard, it may be the fact that the police are more vigilant?—I think cases are taken into court now very often where probably the vendors would only have been cautioned before.

394. That might be accounted for by the increased vigilance of the inspection, might it not?—Yes.

395. (*Dr. Voelcker.*) You would not attribute it directly to the standard being a harder one to reach?—No.

396. If we then took the standard such as you suggest, or if any other one were fixed, would it not be the case still that an analyst would use his discretion?—Yes; whatever standard is fixed an analyst must use discretion in handling it; he cannot be merely a calculating machine.

397. Would you have any objection to telling the Committee how you would tell the cases where water was added, or cream removed, or separated milk added; what would guide you generally in saying in the first place when water was added to a milk?—If I had a sample of milk, and found in it less than 8·5 of non-fatty solids there would be a *prima facie* case against that milk.

398. It would be a presumption that water was added?—Yes, if the percentage were not very much below the 8·5; if it were only one or two-tenths per cent. short of the 8·5, then one would take other matters into consideration. One would take into consideration the percentage of fat, for instance. If one found 4 per cent. of fat, say, with 8·4 of non-fatty solids, I think no analyst would have any kind of hesitation in at once saying that that must be passed as a genuine milk, though it was below the 8·5. On the other hand, fat might be low as well as the non-fatty solids, and that would again help the *prima facie* assumption that the sample was watered. Then if the ash were found to be also low, if it were found to be below 0·7 per cent., for instance, that again would help the *prima facie* indication.

399. As regards watering?—Yes. On the other hand, if the ash were high, 0·75 or 0·76 per cent., no borax or salt, of course, being present, that would rather indicate that the milk was of an abnormal composition. In that case, probably if the case were one which seemed to call for further investigation, it would be found that if the milk were abnormal, the milk-sugar was low, or that the proteids were high in proportion. On the other hand, if the ash was low, and if the nitrogen was low—if everything was low in proportion—then that would confirm the supposition that it was watered. Of course, whether an analyst, having taken all these things into consideration, and coming to the conclusion that the sample was watered, with a deficiency of only 0·1, would in all cases think it worth while to return, "This sample contains at least 1 per cent. of water," or whatever would be indicated, is another matter.

400. Then, as to the removal of cream, what would you be guided by?—I should consider that a *prima facie* case was established when the percentage of fat fell below 3. But if that were ascertained, with abnormality in the other constituents of the milk, I should feel doubtful about fat having been removed. In fact, I may say incidentally that I think I have never certified that a milk has had fat removed. I have always in my own certificates contented myself with saying that the milk was deficient in fat to the extent of one-fourth, or whatever the fraction might be, of the quantity proper to genuine milk. That enables magistrates to deal with the case on the ground that the milk is not of the nature, substance, and quality of milk without deciding the question as to whether the vendor has, or has not actually removed the fat.

401. Would you ever be able to report on the basis of figures your belief that separated milk had been added to another milk?—I can see no way at all of distinguishing between abstraction of fat and the mixture of separated milk. The two things seem to me to be absolutely the same thing, it makes no difference whether you take away one-tenth of the fat, or whether you put 10 per cent. of separated milk, it seems to me it is exactly the same.

402. Then, to pass to your own figures and suggestions: all your calculations are based upon a consideration of the fat and of the solids not fat?—Yes.

403. Have you gone into those figures at all on the basis of the total solids instead of the solids not fat; and if so could you tell me if there are any cases which you would have reported unfavourably upon in which 12 per cent. of total solids was not reached? You have suggested 8·5 and 3 per cent., making 11·5; are there any cases in which if the standard had been 12 per cent. of total solids the requirements would not have been met?—Yes, there are a great many cases. I cannot tell you the number, but there are a very considerable number out of the 575.

404. In the case of genuine milks—I am speaking only of genuine milks?—That, I am afraid, I cannot answer.

405. On the top of page 5 of your *précis* you say, "Of the 55 samples below 8·5, 25 were, it will be seen, above or not below 8·4, and in most of those cases the fat was fairly high." My question is directed to the point as to whether 12 per cent. of total solids would not be a more satisfactory basis than a standard of solids not fat and fat?—The 12 per cent. standard, or limit, would have to be fixed in conjunction with some limit for fat.

406. I quite agree with that?—Otherwise the milk might be very easily watered.

407. That I quite recognise; I am only speaking of the question of total solids as against solids not fat. Would you have, I mean, any great objection to take 12 per cent. of total solids along with a fat percentage, as against your suggestion of 8·5 of solids not fat, and 3 per cent. of fat?—I should see objections to taking 12 per cent. of total solids with a 3·5 minimum limit for fat; 12 per cent. of solids with not less than 3·25 of fat as a minimum might possibly work; I think it would work in the majority of cases—but not 12 per cent. of total solids with 3·5, which has been suggested.

408. If we took as one of the alternatives or desiderata the standard that you have put at 12 per cent. of total solids and 3·25 of fat, would you think that if anything fell below that an analyst might very reasonably have a presumption raised in his mind that the milk was adulterated. There would be no practical difference in application between a 12 per cent. of total solids with 3·25 of fat and what you have suggested here, 8·5 of solids not fat, and 3 of fat—no injustice would be done?—I think a great deal of friction and trouble would be caused by the 3·25 limit.

409. Then it would be on the point of the fat?—Yes.

410. On the point of solids you would not have any objection?—On the point of solids I should not have so much objection.

411. (*Chairman.*) Do I understand you to say that you are going to alter your proposition as put down on page 3 of your *précis* that by normal milk you mean 8·5 per cent. of non-fatty solids, and 3 per cent. of fat; your total, I take it, of normal milk is contained in 11·50; or does Dr. Voelcker get from you the fact that you have altered that?—I have taken that, as he now puts it.

412. Are we to understand that you do not object to a statement in these terms—12 per cent. of total solids of which not less than 3 per cent. should be fat; that does not necessitate 9 per cent. of solids not fat?—I am afraid that difficulties would arise even with 12 per cent. of total solids and 3 per cent. of fat.

413. (*Dr. Voelcker.*) We have had it in evidence from Dr. Hill, and I have reason to know there is a good deal of other evidence to the same effect, that practically the 12 per cent. of total solids would not be any injustice, while it would keep out a great deal of adulteration; so I ask you if taking any of the facts brought before you you could mention any case in which injustice would be done by the fixing of 12 per cent. of total solids as one of the items of a standard?—I return a great many milks as genuine not merely as passable, but with the full conviction in my mind that they are genuine, which give less than 12 per cent. of total solids. They may not be a large percentage, but there are a great many.

414. You say in your evidence that a standard of solids not fat of 8·5, and of fat 3 per cent., giving a total of 11½ per cent. of total solids, works well?—Yes, I think it does.

415. At the same time you say that they are both of them low limits?—Yes.

416. And admit of adulteration?—Yes.

417. You would, I take it, now agree that a raising of that 11·5 of total solids to 12 would shut out a good deal of adulteration which does come in now?—Yes, and I am afraid it would also shut out some genuine milk, which is the difficulty.

418. What would your objections be, and on what would they be based, as regards the effect of the solids and the non-consideration of the fat within the 12 per

cent. and 3 per cent.?—The 3 per cent. is obviously far too low if you take 12 per cent. of total solids. If you demand 12 per cent. of total solids you implicitly must demand more fat than 3.

419. But I understood you that you cannot point me to any cases where 12 is not satisfied as regards total solids?—I could point you to a great many cases had I all the figures instead of having only brought averages here.

420. We have had from Dr. Hill that it is very considerably above 12?—The average is considerably above 12, but then that average, in my case at any rate, includes a great many samples that are below 12, and I take it that must be so also in the case of Dr. Hill's samples.

421. You must remember that we are only fixing now a point at which presumption may be raised, but still one can appeal to the individual circumstances?—But if that appeal is to take place through the machinery of a police court, if it comes often especially, it may inflict hardships upon individuals which I do not think the law contemplates.

422. I ask you, having admittedly stated that 11½ is a low standard, and allows of a lot of adulteration, whether the country's interest generally would not be protected by fixing 12 per cent. of total solids, such as Dr. Hill suggested?—Undoubtedly the country would to some extent benefit, but the average figures are obtained by Dr. Hill, even under the present state of things, where we have a working standard of 8·5 and 3; and the average figures obtained by myself and the average figures obtained by, I think, nearly all public analysts from the samples that pass through their hands show that the practical effect of the 8·5 and 3 standard is not to lower the average quality of milk which is at present satisfactorily high, but there are individual cases that have to be met. I do not think that the merely putting, as it were, a Government stamp on the working standard which at present exists, through the decision of this Committee, would in any way tempt people to water milk any more than they do at present. It is quite possible and probable that the increasing of the standard would check a good deal of adulteration which still does go on in towns; but what has to be considered, I take it, is whether that gain is commensurate with the trouble that might be caused.

423. As far as you know, the Society of Public Analysts would not have any objection to a statement of total solids and fat in place of the present system of solids not fat and fat?—As far as I know they would have no objection to some scale fixed on that principle, but where the proportion of fat should be fixed is of course a very important matter.

424. Have you anything yourself to say against a statement of total solids along with a percentage of fat, as compared with a statement of solids not fat and fat?—No, provided it be guarded. It must be guarded; I am rather afraid that the fixing of total solids with a figure for fat, unless that figure is very carefully fixed, will allow watering, which is not allowed now. That is what I am afraid of.

425. Is it possible or advisable to put in a further proviso as regards anything beyond the total solids or the solids not fat, or the fat, such points, for instance, as the existence of a low ash or low percentage of nitrogenous constituents; and if so, what figures would you suggest?—I should suggest that those should be matters left entirely for the analysts, if possible in consultation with the Government laboratory. Considerations of that kind as to what should be supposed to cause a milk to be deemed abnormal are matters which the analyst should deal with. The standard should be made with reference to normal milk, and not with reference to abnormal milk.

426. You would maintain, I believe, that at the present time differences in the methods of analysis would not cause any practical variation of opinion between the authorities?—No, I think not.

427. (*Major Craigie.*) I would ask you with reference to the point Dr. Voelcker has just been referring to whether you yourself consider that there would be any real difference in working between a standard such as is suggested, adopted by regulation as Section 4 of the Act provides—creating, it is true, only a presumption—and the present practice—we may call it at present the unofficial unannounced practice—of 8½ per cent. and 3 per cent.?—If there would be any difference, I think it would be in this direction, that the official stamping of the present standard would make it more effective. At present if an analyst certifies that a milk is adulterated on the ground that it is below a certain limit, the present limit, the defendant does not attempt to prove that the milk that he sold was genuine, but he will put somebody into the witness box to prove that there have been cows that have given poorer milk, and so forth, and that is sometimes admitted as extenuating circumstances, and the case is dismissed. I think it works well in spite of that. I think it would act very much better if it were officially stamped. I do not think the result of officially stamping it would in any way tend to increase adulteration, as has been very freely suggested; I think it would be in the other direction.

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428. You think there would be no counter effect by the official promulgation of a standard in lowering the general supply of milk?—No, I think not. In fact, one has heard in earlier days, even before the 2·75 limit, when milk analysis was more or less in a chaotic condition, and when there were misunderstandings as to the meaning of the results yielded by one method and those yielded by another method, and so forth, and when a certain standard which was taken at the Government laboratory was considered to be low—one has heard that people used to state in the police courts that they only had put in so much water, which they understood was the "Government allowance." I mention that merely to show that there has been an impression that the standards which are in existence are in some way official—Government standards—a recognised method. I do not think it would make any difference at all to officially stamp the now existing standard, except in the eyes of magistrates, who would be strengthened in the administration of the law.

429. (*Professor Thorpe.*) It would not be Somerset House; it would be the Board of Agriculture now?—Yes.

430. (*Major Craigie.*) I think you stated that your impression was that the number of prosecutions has been increased lately, or the number of convictions rather?—That is my impression.

431. Speaking generally?—Yes.

432. There is a difficulty about obtaining an actual return of the number, is there not?—Yes, but from what I gather in conversation with my friends, and the cases I see in the paper, I think I can state that.

433. Do you attribute that to an improvement in the feeling of the prosecuting authority, and to greater vigilance in the execution of the law, because of greater public attention being directed to it?—I think the prosecutions are undertaken more fearlessly now for small deficiencies than they were.

434. When you say that now a greater number are undertaken than there formerly were, do you mean within the last three years or four years, during which this question has been the subject of a great deal of discussion in the Press and in Parliament, or do you go further back, and do you say within the last ten years more than within the previous ten years?—I am thinking rather of months, since the hands of the public analyst have been strengthened by the action of the Government analyst.

435. And by the action which has already taken place under the Act of last year?—Yes.

436. If I might go back to that question of the Dutch cows, although it is scarcely germane to our inquiry, you are, of course, quite aware that no Dutch cows can be imported, or have been for many years imported into this country, that is no cows of real Dutch origin since the absolute prohibition of the landing of Dutch animals in 1892, can come from Holland?—I am quite aware of that.

437. The term Dutch cow must mean, therefore, cows of Dutch descent?—Yes.

438. And those cows of Dutch descent are not of Dutch descent on both sides; they are crosses, are they not?—I suppose most of those now in existence probably would have a cross in them, but I do not know whether the supply of pure Dutch bulls has actually died out.

439. Do you know at all if there are any Dutch bulls in the country?—I really do not know. I never saw a Dutch bull.

440. (*Chairman.*) I have never seen a Dutch cow in this country?—In Essex there are plenty of them, and the Dutch strain is constantly seen even when it is supposed to have died out, in the appearance of a calf having the characteristic blue-black markings of the Dutch.

441. (*Major Craigie.*) Have you in the analyses that you have been good enough to put before the Committee made any distinction as regards the age of the cows; have you any information on that subject?—None whatever.

442. Not as to the result of the milk from cows of different ages?—None whatever.

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443. With reference to one of the paragraphs in the précis of your evidence referring to a year of particular drought, in which certain abnormal effects were more prominent, would you mind mentioning the year; was it 1893?—I think it was 1895.

444. Not 1893?—No, I think it was 1895; there were two or three successive years of drought.

445. (*Mr. Murphy.*) Referring to the 560 samples that you have mentioned, you say 97·4 per cent. gave 3 per cent. or over of butter fat. Would it be possible to supply the figures of the proportions that would give 3·5 per cent. and over?—Yes, I could supply those.

446. You heard Dr. Hill's evidence just now, in the course of which he gave a standard which is a little different from your own?—Yes.

447. I want to see how these figures of yours come out as tested by his standard?—I heard Dr. Hill's evidence just now, and I disagreed with what he said about the morning and evening milk. There is a considerable difference.

448. Are you judging mostly from London milks?—No, my experience of London milk is small.

449. The morning milk, as received in London, comes up to London from different parts of the country?—My experience of London milk is small. I am not analyst for any of the London parishes, and therefore I have no opportunity of regularly examining the London milk supply.

450. Have you any experience of the foreign milk, the milk from France, for instance, that has been coming over here of recent years?—No, I have none.

451. (*Mr. Cowan.*) You speak in your *précis* about 517 samples, averaging 8·86 and 3·64; in what season of the year were those tests made?—More of them would be from October to March than from April to September, because milk is more apt to be watered in the winter time, and therefore inspectors take more samples in the winter than they do in the summer in the counties with which I am connected.

452. Of course, those samples were taken at a time of the year when you may consider milk was richer, say from September to March, than it is during the late spring months, were they not?—Yes.

453. Would those samples have averaged that if you had taken them at the early part of the year?—I have condensed the figures as much as possible for convenience, but I took out separately the summer and winter averages, and there was practically nothing between them.

454. Was there not?—No; a second decimal difference I think only.

455. Was it the whole day's milk, that is the morning and evening milk, that you tested, or was it confined to the evening's milk?—In these miscellaneous samples I have not the slightest idea. They were mostly purchased milks. In the case of that Essex shorthorn herd that I gave, the morning samples and the evening samples are classed separately.

456. I noticed that you passed a number of samples that were before you which you considered doubtful?—Yes.

457. May I inquire if the producer or the contractor should keep his milk up to the standard, supposing a standard is fixed now by the Government or the Board of Agriculture, would you pass it as genuine if it came up to the standard, and supposing you knew that either separated milk or water had been added to it?—If I knew?

458. Yes?—No, certainly not.

459. Even if it came up to the standard?—Certainly not; it obviously would not be genuine.

460. (*Chairman.*) You mean rather if it had been drawn down to the standard. (*Mr. Cowan.*) Yes, either drawn down or brought up?—All that I can say would be that it was safe to sell it.

461. But I understand you would not call it genuine?—No, certainly not.

462. (*Mr. Barham.*) I see that most of your samples have come from Leicestershire, Rutlandshire, and Wiltshire?—Yes.

463. I suppose, as a matter of fact, those are three of the best counties for rich milk, or the counties that give the best milk; Leicestershire and Rutlandshire are, as you know, the places where Stiltons are largely made?—Yes.

464. And as to Wiltshire, perhaps you may have heard that milk is said to be so rich there that when the cream is skimmed off it is added to other milk to make cheese? I suppose those counties are counties noted for their rich milk?—Leicestershire certainly is.

465. You will not say anything about Rutlandshire—you perhaps do not know?—Leicestershire and Rutlandshire I class as one for practical purposes, but my experience of the Wiltshire milks is that they are somewhat poorer than the Leicestershire ones.

466. Then we may take it that the bulk of these samples which you have had—269 from Leicestershire and Rutlandshire—is about as good milk as the country can produce—I mean so far as the country and the locality is concerned?—I should think so.

467. Now, you got an average of fatty solids there to the amount of 3·63 per cent.?—Yes.

468. You have told us in your *précis* very clearly, but it has not come out in the evidence, that the difference in the amount of fatty solids between morning and evening milk is 0·53?—The difference in fat was 0·43 between the morning and the evening.

469. I am afraid my arithmetic is bad then; I worked it out in the cool of the evening last night, and I made it 0·53?—It is 0·43. It is 3·91 in the one case and 3·48 in the other.

470. Very well, we will take those figures, if you say so. Allowing that two-thirds of that milk was morning milk and one-third evening milk, that would, I think, reduce your average fat to about 3·25; I may not be exactly right to one or two very minor figures, but it will come out practically, I think, at about that, taking two-thirds as the morning's milk, which I think is fair?—I suppose it would be about 3·35, or something like that.

471. I will take it as that, that is near enough?—3·35 would be the figure for the morning.

472. (*Chairman.*) I do not quite follow how that is arrived at?—The 3·63 is the morning and evening milk, and possibly, mixed in the proportions of the total yields, on an average that would be so; but the yield of the morning milk is greater than the yield of the evening milk. If the morning milk contains in itself 0·4 less than the evening milk, the average for the two mixed in the proportions of their production would be lowered by nearly 0·3 or 0·2 something, making about 3·35 for the morning.

473. You cannot get it lower than the average of the morning now; it cannot be less because the morning milk is the lowest of all. I do not see how you can work that lower down?—We are talking, I think, of different cases. Mr. Barham referred to those Essex Shorthorn milks to get at the difference, and now he is asking me to apply it to the average Leicestershire results; is not that so?

474. (*Mr. Barham.*) I am afraid it is all my fault. Dr. Dyer states that the milk which I say comes from two of the richest counties in England contains butter fat to the amount of 3·63, and that in order to ascertain the amount of butter-fat that the morning's milk must contain, we must take up half the difference between those two averages of the morning and evening milk from the figure he has arrived at, namely, 3·63. Dr. Dyer has done that, and makes it work out to about 3·35. I think it is rather less than that; I fancy it is 3·25, but, however, it is not worth while talking about it. So that now we get an average from these 517 samples, or the 239 samples from Leicestershire and Rutlandshire, of butter-fat production of 3·35?—Yes.

475. I am speaking now of the morning's milk entirely?—That, of course, assumes that these samples are on the average half morning milk and half evening milk: we do not know anything about that.

476. (*Professor Thorpe.*) It also assumes that they have been mixed together in equal volumes?—Yes.

477. (*Mr. Barham.*) May you always assume that they are mixed in equal quantities from the two milks?—I am afraid that assumption is not altogether justified, because an inspector's duty is, as far as he possibly can, to drop upon the people selling adulterated milk, and, therefore, a large proportion of these samples would probably be bought on Sunday mornings, the assumption being that if a man waters his milk he is more likely to water it on a Sunday morning than at any other time, because that is a time when working people want a little extra milk for making puddings and custards and so forth, so that the larger proportion of them would be morning milk probably than evening milk on that account. Then, of course, it would depend upon what milk was sold in the

morning, whether it was the morning milk that was sold in the morning, or whether it was the evening milk. These samples may have contained a considerable proportion that were watered; these are samples that I thought it my duty to pass as genuine, but they are not necessarily genuine samples, there may be a great many samples containing small quantities of water.

478. (*Chairman.*) Can you tell us whether anything is known where these samples came from, and whether they were representative of the whole of the districts that you have mentioned?—I know nothing of the great majority except that they were produced in the counties.

479. I suppose they were samples furnished you by the county authorities?—Exactly.

480. But you do not know which part of the county they came from?—I knew that at the time.

481. Have these samples been spread over the whole of this district?—Yes.

482. So that we can judge from them what the average of the district would be?—The larger proportion of the Wiltshire milks would probably be taken in Swindon, which is a large country town; but the Leicestershire milks would be taken exclusive of the town of Leicester itself; they would be taken indiscriminately all over the county, the majority of the samples being taken from the villages.

483. (*Mr. Farmer.*) Do you put forward the analyses of these samples as the analyses of milk known to be genuine?—No.

484. If you do not I do not see how they affect us at all?—They simply illustrate the milk that is supplied at the present time to the public in those districts, that is all.

485. They are not given as being known to be genuine?—No.

486. You simply passed them because they were above the standard?—I passed them simply because they were above the standard.

487. (*Chairman.*) They were above suspicion, would you say?—They were not above suspicion in all cases.

488. (*Mr. Barham.*) What I was leading up to, and what I think you will find is the case, is, supposing, as we may, I think, suppose or assume—whichever way Dr. Voelcker pleases to put it—that half is the morning milk and half the evening milk, that would give as the average of the minimum about 3·35 of butter-fat?—Something like that; it would be below the 3½.

489. In order to get at that average a great number of samples must have been below 3·35?—Yes, a great many of them. A great many of them would be just over 3.

490. Under those circumstances do you think it would be in any way safe to take the 12 per cent. of total solids as the minimum with 3½ per cent. of butter-fat as a standard upon which you would convict men of having sold adulterated milk?—3½ per cent. of fat would certainly, in my opinion, be too high.

491. 12 per cent. of total solids would give, of course, 8·50 and 3·50, or might give 3·40 and 8·60, whichever way you please to have it?—Yes.

492. (*Chairman.*) I understood you to say that if you have got 12 per cent. of total solids you must have more than 3 per cent. of fat?—You would have almost invariably.

493. You could not get 3 per cent. of fat and 9 per cent. of solids not fat?—If I got 9 per cent. of non-fatty solids and 3 per cent. of fat, I should then be pretty sure that that milk had been skimmed.

494. In fact, those are not the right proportions?—When I had 9 per cent. of other solids I should want 3½ per cent. of fat to make me happy.

495. You would want 3½ per cent.?—Yes, if I had 9 of non-fatty solids.

496. (*Mr. Barham.*) And judging by the experience of five years as shown in these 517 samples, it would not be practicable for you to get 3½ per cent. of butter-fat; you could not do it without a great number of convictions of innocent men?—So many men would not be convicted, but so many men would have to be called up and prove their innocence that I think the magistrates would soon get very tired of the matter.

497. Supposing that we took the 9 per cent. of non-fatty solids which is suggested instead of 8·50?—I do not think that has been suggested quite; 12 per cent. of total solids with at least 3 per cent. of fat was Dr. Voelcker's suggestion.

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498. As a matter of fact, a great number of samples have been taken in various parts of England for some years past. Up to a certain period it is said that the fatty solids or the limit for fatty solids was 2·75, and that recently it has become 3 per cent.?—Yes.

499. You say that the prosecutions have increased; would that not be so if the limit were increased from 2·75 to 3; would there not be more outside the 2·75 than outside the 3 per cent. limit; it would naturally be so, would it not?—I am afraid I do not quite follow.

500. I was very involved, I am afraid?—It is my fault, I am sure, but I want to understand the question.

501. No, it is not your fault; if the standard were increased——?—From what?

502. From any point to any point—I take it wide, of course—there would be more convictions; there must necessarily be so?—Yes, I should think so.

503. Where the limit is increased it follows, of course?—I should think so.

504. So if the convictions were increased when the standard was raised from 2·75 to 3, of course the convictions—you will take it, I suppose, as being the logical result—would increase very considerably if the standard were further raised from 3 to 3·25?—Undoubtedly there would be a great many more cases.

505. Now, in practice, we have heard to-day, that the limits, or the standards, have recently been, over some months past, 8·50 and 3 per cent.?—Those have for many years been the standards of the Society of Public Analysts.

506. And they have based their opinions upon those standards?—Yes, for years past.

507. I mean in giving their certificates their results have been based upon those standards?—I think most of them have. Occasionally some analysts have been guided by the old Government limit of 2·75, simply in order not to have disputes.

508. And so far from that limit having caused farmers and dairymen to water and skim their milk down to it you have proved to us to-day that 517 samples have come above that limit, and less than 10 per cent. below that limit?—That is so.

509. Some of those samples could have been skimmed very largely, many of them you say could have been watered, but they have not been watered, although the producers of the country could have done so if they had chosen?—That is so. The average is good.

510. It is very good indeed?—The average is good, notwithstanding the admittedly low standard which we took.

511. Therefore, you have no reason to suppose that if we still continue to fix that standard any greater adulteration would take place more than it does at the present time for that reason?—No, less would take place, I am quite sure, because the standard would be more rigidly applied if it had a Government stamp.

512. If the limits of 8·5 and 3 work well in practice, and, properly used, inflict no injustice on the milk producer or seller, will they protect the public against excessive adulteration? You say properly used, I notice; that means to say, used by an analyst of experience, and judgment, and discretion?—Exactly.

513. But if they are improperly used they would tend to operate very harshly, I take it; when I say improperly used, I mean in this sense, that you use them properly because you combine them with other tests; when you have a sample which you call abnormal, or what I should call, perhaps, unusual, you test it for ash, and for other things which Dr. Vieth suggests are almost invariably found in regular proportions?—Yes, I do that.

514. You test the samples for that?—In some cases.

515. And that confirms your opinion as to whether a milk is adulterated or whether it is one of those samples which is not adulterated, but is rather low in its fatty solids or non-fatty solids?—Exactly.

516. So that, although you suggest that the limits should be 8·5 and 3, yet you have no doubt in your own mind that they would work unjustly at times unless they were used with discretion and by an analyst of experience?—They must not be applied, in other words, to abnormal milk.

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517. You must not have a hard and fast line?—Yes; they can only be used in application to normal milk.

518. Then you say you have excluded from among the results of those, samples returned as adulterated?—Yes.

519. Do you know, of your own knowledge, that those samples were adulterated?—No.

520. Do you infer it?—I infer it from the analytical data; and some further inference is added from the fact that, as I say, I do not recollect in any case the adulteration having been disputed.

521. True; but do you not think it would be much easier for a little retail dairyman, who cannot trace his milk, to submit to a fine of 20s., than it would be to bring analysts, and lawyers, and all sorts of people into court and trace a milk to its source at a cost, perhaps, of £20 or £30?—You mean to say that a man may have simply not defended the case rather than have the trouble of defending it?

522. Yes?—In that case, if it were an innocent man, he would say that he had not watered it, and he did not think it was watered—he had no knowledge, and so forth.

523. True?—The usual excuse is—"Well, we had been rinsing out the cans and a little water may have remained at the bottom," or some trivial suggestion of that kind; in almost all the cases they send me the newspaper reports, and when one sees nearly always something of that sort one comes to the conclusion that there was not much doubt about it.

524. (*Professor Thorpe.*) Has he not got, without any very material expense to himself, the right to appeal to Somerset House?—Yes.

525. That is so; he could get your analysis checked for a mere nominal fee?—Yes. I recollect that some of the samples I have analysed have been sent to the Government Laboratory at the request of the defendant, but I do not think a sample of milk has.

526. That is what you mean by the result not being challenged—namely, that no appeal was made to the magistrate to refer the second portion of the sample to Somerset House?—I mean that, and in some cases more than that—that it is virtually pleading guilty.

527. (*Mr. Barham.*) I take it, following up Professor Thorpe's query, that the analysts know a great deal more about Somerset House than a little dairyman or a small farmer in a country village?—He is always defended by the local solicitor.

528. (*Professor Thorpe.*) The little man knows perfectly well about that?—He knows whether he has adulterated or not.

529. (*Mr. Barham.*) Apart from those samples that you have condemned as adulterated, because of their not containing certain proportions of solids, you still find 10 per cent. were on the border line somewhat below your standard, and yet which would not justify you in causing a man to be prosecuted or convicted for adulteration?—Yes, but of that 10 per cent. 4 per cent. were barely below the border line.

530. Still they were below the border line?—Yes, those samples that were from 8·4 to 8·5 I have included rigidly just as they are. Those include the 8·48's, the 8·49's, and the 8·47's. I have put down everything that was actually below, but many of those were virtually 8·5.

531. On page 7 of your *précis* you refer to drought, hot, dry weather, and so on; I do not know whether you have seen the remarks of Mr. Stokes with regard to a dairy of cows that he tested during the recent drought, which appeared, I think, in most of the dairy prints, and I think in "The Analyst" also?—Yes, I remember some results.

532. You have seen that his figures there for non-fatty solids are, in some cases, below even 8 per cent.?—Yes.

533. He says he saw those cows milked himself?—Yes; unfortunately Mr. Stokes did not make any further examination. He confined his analyses simply to the determination of the solids, and of the fat; he did not investigate the constitution of the solids at all.

534. I daresay you have seen cows at the Royal Show at Maidstone?—Please do not mention shows. I could give you a lot of information about shows. I have plenty of cases of abnormal cows at shows every year. At the Essex Show we have milking competitions, and they give extraordinary results. At shows cows are under strange circumstances with strange surroundings, with people glaring at them, and they hold their milk back, and do all sorts of things.

535. (*Chairman.*) They are abnormalities then?—They are not included among my abnormalities at all, but they give extraordinary results. I have sometimes got very curious results from the milk of cows at shows, milk that I have seen drawn myself, and then when the cows have been quietly milked the next day in the quiet of the evening, and nobody about, or early in the morning, they have given excellent milk, bearing no resemblance at all to the fluid that was extracted from them the day before.

536. (*Mr. Barham.*) I will not trouble you further with regard to milk generally; you are not prepared to suggest a standard for the fatty solids in cream?—No, except that, if standards are fixed, it seems to me that you cannot have the same standard for separated cream as you could for hand-skimmed cream.

537. Now, with regard to the condensed milk; do you not think that condensed milk might contain as much fat when it is watered down to the same consistency as new milk—as new milk itself should contain, unless it is notified on the tin, of course?—By "down to the same consistency," what do you mean?

538. I mean if milk is condensed and the water evaporated from it?—From the pint?

539. From the pint?—When it is made up to the pint again it should have its original constituents?

540. Precisely?—Exactly. I would fix a distinctly higher standard for the fat in that case.

541. Because it can be controlled?—Yes, and a man need not use milk that is lower than 3·5, say—the factory milk would probably be from 3·5 to 3·7, and I do not see why he should be allowed half a per cent. on that.

542. We have heard a great deal about Dutch cows to-day, but I assume that these figures that you suggest as the definite standard, 8·50 per cent. and 3 per cent., are not based in any way upon the milk of Dutch cows?—No, those are above the milk that is often given by Dutch cows.

543. (*Mr. Farmer.*) Do you imagine that since the Local Government Acts of 1887 and 1894 the local authorities have been much more vigorous in taking samples than they were formerly, and whether that might possibly cause the increase in the prosecutions?—I do not know. My samples are, for the most part, from counties. The tendency is to take more samples every year.

544. I understand you to say that the 517 samples that you have mentioned here are not samples really of milk known to be genuine?—No, not of milk known to be genuine.

545. You do not advance them at all as a basis upon which we can rely as being genuine milk?—No. By far the greater proportion of these samples are undoubtedly genuine, but there would be a certain percentage there which may possibly have been adulterated.

546. They are not known to be genuine?—No, they are not, but most of them would yield results that would give no doubt of their genuineness; still I include this.

547. (*Chairman.*) You object to 12 per cent. of total solids because you think it would inflict hardships; you say you could not think of 12 per cent. of total solids and only 3 per cent. of fat; would you take the proportion of 8·75 of solids not fat and 3·25 of fat, and work it out?—8·75 would be too high, in my opinion. I think there is undoubtedly plenty of genuine milk that does not give more than 8·5, or very little more than 8·5; and if you took the 12 per cent., as including 3½ per cent. of fat, I think you are demanding more than can in many cases be given; and if you take 12 per cent. and 3 per cent. that will not do away with skimming.

548. What is your ideal analysis, taking 12 per cent. as the total; how can we break it up?—12 per cent. with not less than 3·25 would be the most rational suggestion, I think—that is on the 12 per cent. basis.

549. And that would be 8·75 of solids, not fat?—Yes, but in a 12 per cent. milk if it were not skimmed there would be more than 3·25 of fat.

550. (*Professor Thorpe.*) Would there be any insuperable difficulty in taking 8·6 of non-fatty solids and 3·4 of fat?—I do not think you would get that. I do not think we can demand more than 8·5, but something or other

might be fixed which must include so much fat. I do not think we must demand more than 8·5. I think there would be constant difficulty.

551. (*Dr. Voelcker.*) If you maintain that 12 per cent. of total solids, of which not less than 3 per cent. should be fat, will not do away with skimming, how would the proposal of 8½ and 3, giving a total of 11½, do away with skimming?—I do not suggest that 8½ and 3 would do away with skimming, but if we are to have a standard it will be sufficiently above that at present existing to cause, as I am afraid it would, a good deal of friction and trouble, then there must be some tangible advantage to the community to compensate for that, and I do not think that there would be that advantage in this proposal.

552. (*Chairman.*) You mean that there is so much genuine milk of this low standard that would be affected?—Not quite so low. It is not often that milk which has just barely 8·5 of solids not fat has also just barely 3 per cent. of fat. The standard or limit which is at present in force is not exactly an 11·5 limit; it is not 11·5, of which 3 shall be fat; it is that there shall not be less than 8·5, and there shall not be less than 3. In order that the milk shall be cut down to exactly those figures, the watering, the addition of separated milk, and so forth, must be done very nicely; it can only be done by the aid of an analyst constantly employed or consulted, and it has to be done almost as a fine art. It very often happens that a milk which is watered is yet fairly rich in fat, though undoubtedly watered, and it also happens conversely.

553. (*Dr. Voelcker.*) You would not admit that a milk that gave 8·4 of solids not fat would necessarily be adulterated?—No.

554. And yet you say now that this figure of 8·5 has been taken as the figure below which it should not fall?—Wherever your limit falls it must be used with discretion. If you fixed 12 as the limit and you found 11·99, surely no public analyst would cause a man to be brought into court for having a deficiency of 0·01 in the total solids.

555. The point is, which is the more satisfactory way of describing the standard?—11·75, of which at least 3 should be fat. There again, you get trouble. I think we must make some demand for both. I think we must demand a minimum of non-fatty solids except for exceptional cases. As I said at the end of my evidence in chief, some compensation might be allowed for the case of milk excessively rich in fat. I think we must ask for 8½ as a minimum for non-fatty solids.

556. (*Professor Thorpe.*) In one part of your evidence you let fall some observations about the possibility of some machinery short of a police-court for rebutting the presumption of adulteration. What did you mean?—I meant this, that if a man has a sample of milk taken and certified to be adulterated he might get notice of that with a copy of the analyst's certificate before being summoned, and asked whether he can produce to the inspector or to the inspector's local authority any satisfactory reason why he should not be summoned, and had he anything to say—"The Public Analyst says this about your milk; have you anything to say before we take out a summons?" If that could be done, then the man's character would be saved.

557. What I mean is this. We none of us wish to bring a man into a police-court or to subject him to any vexation or worry, and we are rather, it seems to me, putting down the standard in view of the police-court; we are depressing the standard in view of the police-court. Now, acting upon the suggestion you have made, if we had some machinery by which the man could clear himself from the imputation short of the police-court, surely we might go in the direction of a somewhat higher standard?—Certainly, if that could be done.

558. Assuming that you can have something of that kind, what would be a reasonable, feasible standard?—I think then we might go to 8·5 and 3·25, making 11·75 of total solids.

559. (*Major Craigie.*) Not 12 per cent. of total solids?—No; I seem to foresee troubles in that.

560. (*Professor Thorpe.*) Why under those circumstances? We have an enormous volume of evidence, hundreds and hundreds of samples of milk, showing that 12 under these circumstances would not be an unreasonable amount; for instance, we have a large number of samples quoted from Dr. Vieth—thousands of them. The average total solids in Dr. Vieth's analyses of 120,540 samples is 12·9 with 4·1 of fat; therefore *primâ facie* it is not an unreasonable standard to fix it at even 12 per cent. for the total solids, provided we have some machinery which would get rid of the vexation and worry caused by bringing a man into court?—If that could be done that puts a different complexion on the matter altogether. What I am afraid of is the frequent bringing into the police-court of men only to take up time and have their characters injured in proving that they had done nothing wrong. If some provision could be made for having the case investigated in an intermediate stage, then I think very possibly the 12 per cent. standard or limit would work.

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561. Are you familiar at all with the process of dairy inspection in Denmark?—No, not all all; I have never been there.

562. You are not aware that there is a kind of court of Summary Jurisdiction in respect of dairy affairs?—No, I was not aware of it.

563. That does not actually bring the persons to the police-court, but allows an investigation to be held?—I did not know of that. That is the sort of thing I am thinking of.

564. That is it which you have in your mind?—That has been the thought in my mind—that if something of that kind could be done, it would enable us to work with a higher limit than we have.

565. (*Chairman.*) Then you would raise the ideal standard up to 12; and how would you divide it then in your opinion—8·50 and 3·50?—When you get to 12 the main thing then is to demand a proper quantity of fat.

566. Dr. Vieth tells us that 3·5 is what his ideal standard would be?—I would say with not less than 3·25 if it is to be a 12 per cent. standard; as a rule it would contain more than that; but if you were to fix it at not less than 3, as Dr. Voelcker suggested, that would mean separated milk.

567. (*Dr. Voelcker.*) I only suggested 3 as a minimum?—Yes, I understand. I think if you have 12, the minimum of fat must be raised a little, say to 3¼; 3½ per cent. would be too high. That is as nearly as I could commit myself in regard to limits. I think I did clearly say in my evidence in chief—if not I should just like to get it on the notes—that an alternative limit should be fixed to meet the cases of milk rich in fat—that is, a limit should be made so that when milk contains 12½ per cent. of total solids, including not less than 4 of fat, no presumption should be raised against its genuineness on the ground of its deficiency in non-fatty solids.

568. I think your answers to his lordship, Mr. Barham and myself, in regard to prosecutions and the increase of convictions were inadvertently rather contradictory?—I am of opinion that the recent increase in convictions, which, I believe, from information which I have gathered, may have taken place, is due to the Government Laboratory having now recognised the 3 per cent. limit for fat.

569. (*Chairman.*) That is only an opinion?—That is only an opinion.

570. You do not know?—I do not know.

571. Of course, you cannot very well know?—No, but I have reason to suppose that lately analysts who had been diffident about reporting anything over 2·75 as being deficient in fat have recently been reporting cases of the kind.

572. Men who were safe before between 2·75 and 3 have not been safe now?—That is so.

573. They are now in what may be called the "danger zone"?—Yes.

574. And I suppose a certain number of convictions have taken place in consequence of that?—Yes.

575. Mr. Barham went on to say that if it has been the case that there have been more prosecutions in consequence of raising the standard to 3, *à fortiori*, if that is carried on there will naturally be more prosecutions again if you raise it to 3¼, and you assented to that proposition. Of course, if the first is right, the second would follow?—Yes, I think it would certainly.

576. After all, the whole of this matter, as far as you are concerned, is a question of conjecture, and you really do not know?—No, I do not.

577. (*Mr. Barham.*) You heard Dr. Hill's evidence this morning, I believe?—Yes, I did.

578. Are you aware from that evidence I have no doubt that if a limit of non-fatty solids of 8·75 had been taken, 36 per cent. of the samples that he returned as pure would have been returned as adulterated?—8·75 would be, in my opinion, altogether too high. Some of the best milk that is sold would then be rejected.

SECOND DAY.

Friday, 2nd March, 1900

PRESENT :

Lord WENLOCK, G.C.S.I., G.C.I.E. (*Chairman*)

Mr. GEORGE BARHAM.
Mr. GEORGE COWAN.
Major PATRICK GEORGE CRAIGIE.
Mr. S. W. FARMER.
Mr. SHIRLEY F. MURPHY.
Dr. J. AUGUSTUS VOELCKER.
Mr. R. HENRY REW, *Secretary*

Mr. A. J. de Hailes.

2 Mar. 1900.

Mr. ALFRED JAMES DE HAILES, called ; and Examined.

579. (*Dr. Voelcker.*) You are an analyst of some twenty years' standing?—I am.

580. A Fellow of the Institute of Chemistry and of other societies?—Yes.

581. You have had a large experience in the analysis of milk and cream?—I have had a very large experience in that.

582. And you are engaged in analysing samples for different dairy companies supplying London and the provinces?—Yes.

583. You are further, I believe, Analyst to the Dairy Trade Protection Society?—I am.

584. And you now represent their views before the Committee?—Yes.

585. Is it your opinion that there is a good deal of adulteration of milk?—I think there is.

586. And those forms of adulteration are principally what?—They are principally confined to the addition of water, or to skimming the milk, or, what I think is more general, not so much the abstraction of cream, as the addition of separated milk to the whole milk.

587. Do you say that the principal addition is not of separated milk or of condensed milk?—The principal addition is of separated milk; condensed milk is generally used when there is a shortness of the milk supply in London.

588. Then, with regard to the addition of preservatives to milk, what are your views?—I do not regard the addition of boron base preservatives as adulterants.

589. On what grounds?—At times there is a need for their use, and they appear to be perfectly harmless. The way I look upon it is that it is a much lesser evil to have a small quantity of a harmless preservative, a boron base preservative, than it is for an infant or an invalid to take milk that is partially approaching the sour state.

590. You have, I believe, expressed yourself rather strongly as to the harmlessness of the use of preservatives, have you not?—I have said that they have been used for the last twenty-five years, and that, instead of having thousands and thousands of cases of proved harmfulness, we have never had so much as one genuine undisputed case of harm being done.

591. You have rather expressed yourself in favour of the use of it?—I say I look upon the use of a boron base preservative as the lesser of the evils.

592. Have you not, in some cases, even gone so far as to say you rather like preservatives than otherwise?—No ; I think I have been misrepresented in this way : If you give me a choice of milk—fresh at the farm, of course, I would say—let us have it without the preservative ; but when it is a question of being delivered to my house in London twenty-four hours old, and you ask me whether I will take it heavily charged with micro-organisms or whether I will take it with a small proportion of boric acid in, I say undoubtedly I prefer to have it with the boric acid in it.

593. You prefer the boric acid to the microbes?—Certainly, and I think it is less harmful to an invalid or to an infant.

594. Have you any distinct evidence as to the frequent occurrence of these microbes?—Unquestionably—they are ever present.

595. We know they are ever present, but do you know that there is a great distinction between harmful microbes and injurious ones?—Yes, but I think it is also known that milk approaching the sour condition, whether they are harmful or harmless microbes that are in it, is in itself dangerous, and a cause of great disease amongst infants.

596. But you would allow that the microbes which cause harm only occur in milk under exceptional circumstances?—No, I do not agree with you ; I think, although the microbes alone which produce the sourness of the milk are considered harmless—that is to say, they are not pathogenic micro-organisms—yet milk that is approaching the soured condition is extremely harmful to infants.

597. Have you any direct evidence on that point?—I think it is well known.

598. Is it a mere matter of opinion?—It is perfectly well known.

599. In your view, while agreeing that there is a great deal of adulteration, you are not in favour of any standard being fixed?—No standard having the force of law.

600. And your grounds are what?—From the great variation that exists in milk.

601. Your objection is that if a low standard is fixed adulteration may occur?—Adulteration will undoubtedly occur. So far as I know, I say it is the dishonest man who really wishes to have a standard fixed, and, of course, he expects it to be a low standard. He wants to have a low standard in order that he may water his milk down to it. I know from experience that there are many milk sellers who, since the Society of Public Analysts have, more or less, made known what their standard is, have made a practice of watering down, so that they can just pass that standard.

602. Therefore a low standard is inadvisable?—Undoubtedly ; it would help forward adulteration.

603. If a high standard is fixed, what then?—Then you are going to injure the honest trader. I should like to put before the Committee some authentic samples that I have here—that is to say, samples that I myself have seen milked, and know to be undoubtedly drawn from the cow. I could speak to enormous numbers of samples. As I have said in my synopsis, I have over a thousand samples a month passing through my laboratory, but I only want to place before the Committee those that I have actually seen drawn from the cows.

604. We will speak of the actual figures afterwards, if you will allow me to ask you on the general point first. While a low standard is inadvisable and a high standard also inadvisable, have you any objection to what might be called a medium or fair standard—a standard that would be fair to consumer and producer?—Really, I cannot conceive of what you call a fair standard?

605. You have, I believe (in fact I have seen many returns from you), set out analyses, and have given your opinion as to samples being adulterated or otherwise?—Yes.

606. In doing that you must have had some standard before you?—Yes.

607. May I ask what your standard has been?—As a rule my standard has been for solids, not fat, 8·8.

608. And for fat?—For fat 3 per cent. I do not want to be misunderstood here. It is a little difficult to say those are actual figures, because I make a very strong point of saying it is impossible to judge the analysis of

milk by any one of the figures alone; the whole analysis should be taken together. As I will show you in these analyses that I am going to put before you, you might have milks with very low solids not fat but which were very rich in fat, and they are undoubtedly genuine milks. On the other hand you might have milks that were very low in fat but also were very low in solids not fat, again being unquestionably drawn from the cow.

609. But still you have in your mind, when judging of the genuineness or otherwise of a sample of milk submitted to you, certain general figures?—Yes. With farmers' milk I have practically looked upon 8·8 as a fair standard for solids not fat, and I have looked upon 3 per cent. as a fair standard for fat.

610. Then you would not consider it unreasonable that a standard something like that might be fairly imposed upon the milk producers?—That is a very different matter indeed. If you are going to make that standard have the force of law, and to say in the case of every sample of milk coming below that standard, there is prima-facie proof of adulteration, I cannot agree to that.

611. If you fix actual figures, and if you found the milk falling decidedly below those, it would raise in your mind the presumption that the milk was not genuine?—Yes, that is quite true; it would raise that kind of presumption in my mind.

612. So if we wanted to fix a standard which would give magistrates, analytical chemists, and others some guide by which a presumption might be inferred as to the want of genuineness of a milk, something not very far departing from that would be a fair thing?—I do not like to say as much as that, because there are such hundreds of milks that come below both of those figures. You asked me what I took as a kind of guide to myself and for farmers' milk; I have given you what I have taken as a kind of guide, but there are a great many other things to be taken into account. There are hundreds of milks that I have not a shadow of a doubt are genuine which will give results below both those figures.

613. But would you not agree that it would be a desirable thing if some standard were fixed which was understood by analysts, producers, and consumers that should give some indication of its character?—No, I do not agree with you at all. I think it would be to the interest of the public analyst and of a portion of the Bench, but I do not think it is to the interest either of the public or of the traders themselves, who know nothing about it.

614. But, if there is no standard at all, who is to be the judge?—Genuine milk.

615. What is genuine?—The honest man will not alter his milk because a standard is fixed. It is the dishonest man who will do that.

616. Who is to say whether it is genuine or not; who is to be the arbiter?—Simply men who are in a position to have sufficient knowledge to know whether the milk is genuine or not.

617. Is it to be left to the analyst?—I think it is better that it should be.

618. Then you would agree that it would be a very desirable thing that there should be uniformity among the analysts?—Yes, I know the difficulty perfectly well; it is extremely difficult.

619. Still, it would be desirable that analysts should agree?—For the analysts, but I do not think it is desirable for the traders or for the public that a standard should be fixed.

620. If analysts and authorities were agreed upon some such standard, it would be a very desirable thing in deciding in cases that were brought forward?—It would be helpful to a portion of the Bench.

621. You mention in your *précis* that the most common cases of adulteration are those which have from 3 to 10 per cent. of water added; is it not the case that the amount of water returned as added is very often below what an analyst has reason to believe is the case because of the impossibility of his certifying unless on very low figures?—Yes. The analyst generally takes too low a figure for ascertaining the amount of water.

622. Many cases have occurred where 3 per cent. of water has been returned as having been added, but the analyst has a very good idea that there is a great deal more?—Yes.

623. But he is not safe in asserting it?—No; in fact, a standard of 8·5 having been acknowledged to be used, has been a cause of a very large amount of adulteration.

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624. You mention that it is the practice among certain dairy analysts to calculate their results from partial data?—Yes, I believe that is so.

625. Would you like to say that in cases of adulteration, cases upon which prosecutions are based, it is the practice there?—No, I do not think so—certainly not.

626. You mention in your *précis* also the differences of quality in samples that have been taken out of the same churn, it may be when milk is going on its rounds?—Yes.

627. You suggest that the last lot left in the churn is very often the richest?—Very often.

628. So that the sample which the inspector has taken first of all may happen to be the poorest?—Yes.

629. Is it not the fact that the tendency is rather for the cream to rise to the top?—It is, therefore the last milk is the richest.

630. If a sample is dipped out of a churn?—But I am not talking of that; I am talking about the usual way the dairy companies manage. A large churn is taken out on a hand truck, and it is drawn off from the bottom into the man's can.

631. Would you agree that it is a question of how the sample is taken—you might have a difference according as to how the sample is taken out, might you not?—It would be very hard to judge of the quality of such milk by the same fixed standard.

632. Do not the inspectors stir up the milk before they take it?—I think it is impracticable.

633. With regard to the cream, I understand that you do not object at all to the thickening of cream by the addition of gelatin?—Not to a small quantity of it, a half per cent. or something of that sort. It is a well-known fact that when cream is pasteurised it becomes thin, and as the public insist upon having thick cream, the only way to make it thick apparently seems to be to add this small proportion of gelatin. I do not think a half per cent. of gelatin should be looked upon as an adulteration.

634. If you do not consider the addition of gelatin to cream or of boric acid to milk as adulteration, what do you consider adulterants?—I consider those things are both essentials under the circumstances.

635. Why is the addition of gelatin essential to cream?—As long as the public demand a thick cream it is essential. Of course, if pasteurising is forbidden then the matter is altered.

636. Do you consider it is not an adulteration to do that, even when it is not declared?—I think it is better to the public not to know such a trifle as that.

637. It is better for the public not to know it?—Yes. We do not want to know every little thing.

638. But if the public buys cream the public does not want to buy gelatin?—That is quite true, but it is so small a matter that I think the public have no wish to know. It is quite harmless, and it is to their benefit. It is what they want. They ask for and expect to get a thick cream. If it is a necessity in the process of manufacture to add a half per cent. of gelatin, there is no fraud in it; the man makes nothing out of it; he adds it simply to suit his customers' taste.

639. Why should not the producer be obliged to declare it?—I think it would probably do some damage to the trade.

640. If he had to declare it?—It is a perfectly harmless ingredient. We do not want to know what is in everything we eat; at least, I personally do not, and I do not think the public generally do.

641. If I buy cream, do I want boric acid with it without knowing it is there?—I do not think it matters.

642. Do you not think there ought to be a declaration of the existence of the boracic acid or other preservative in cream?—I think perhaps it might be mentioned that it was a preserved cream; it might be advisable to do that.

643. Would any harm be done to the trade, do you consider?—I am not sure about that. It would be an extremely difficult thing to have to declare it on the sale of every sample. I am very strong on that point, even with regard to the milk. The declaration of the presence of a preservative in every sale that takes place is absolutely impossible; nobody will do it; nobody can do it. If you have a dairy serving out 300 customers in the morning, how is it possible for anybody in a shop to declare 300 times that his milk contains a preservative? If a notice in a shop is a sufficient declaration, then I think it is quite possible to do that.

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644. Then your general opinion on this question, to sum up your evidence, is that you do not advocate the fixing of any standard by law, but that you would allow the individual analyst to be the arbiter?—I think I must say that. The fixing of a standard would mean that the Bench would simply have before them the question: Is this milk below the standard? Yes, it is. Very well, then.

645. But you allow that at the present time there are enormous difficulties owing to one analyst saying the milk is genuine and another one saying it is not?—Yes, there are enormous difficulties. Of course, a public analyst has to judge too on the analysis which is in front of him, according to the standard that he adopts, whereas the milkman himself or the farmer may have very good reason for knowing why the milk is below the standard. I mean to say he may be able to prove why his milk is below the standard, and he ought to have that right to show whether his milk is genuine.

646. Would you maintain that as long as the milk came from the cow and had no addition of water to it, and the separation of the cream, it should be allowed to pass into consumption?—No, I would not say that—certainly not.

647. What reservation would you make?—If you say anything that comes from the cow's udder should be called milk, then, of course, the question of disease comes in, and of improperly fed and improperly treated cattle.

648. How would you as an analyst discriminate between milk from a properly-fed cow and milk from an improperly-fed cow, unless you had some standard to go by?—You could not even with a standard. I have myself over and over again certified milks to be adulterated with added water, and have found afterwards that they were not anything of the sort.

649. Then you agree that the analyst is a very uncertain individual at best?—He is in a very difficult position.

650. But there is nobody better?—No, there is nobody better.

651. Therefore everybody, according to you, would be allowed to have his own free will, and there being no standard, adulteration might be rife throughout the country?—No, certainly not.

652. What check is there?—I think there should be no standard having the force of law. By all means let analysts have a standard amongst themselves.

653. Therefore there would be no standard in law, and it would be left as it is now to conflict of opinion between analysts?—I think every vendor of milk should have the right to prove whether his sample is genuine or adulterated, and not be simply told by the Bench that his milk is below the standard and, therefore, he must be convicted.

654. How would he prove that his cows were properly fed; to whose satisfaction would he prove that?—Of course, he cannot prove that his cows are properly fed. Those whom it probably will come before know nothing about cattle feeding, and cattle feeding is not necessarily the only thing that affects the quality of the milk.

655. No; there is the keeping of the cows, for instance—the way they are kept?—Yes. Then we know that their breed causes a great variety in the quality; we know that their feeding, their age, and the period of lactation affect it.

656. Allowing, as you do, that the extent of adulteration practised in regard to milk is unquestionably very large, you do not see your way to suggest any means by which known adulteration can be checked more than it is at present?—I think, if I had my way, I would raise the standards for solids not fat that have been given out as 8·5. That is an absolutely low standard. But I would not give it the force of law; it is not fair from my standpoint that a man should be told simply because his milk is below the standard therefore he is to be convicted.

657. You do not object to the standard of 8·5 as being too high?—I think it is too low.

658. But you would object to that having the force of law?—Yes, I should, because, as I say, a milk very rich in fat may give 8·3 of solids not fat. That would be a case where a man is selling extremely rich milk.

659. Somebody must be the arbiter. What would you say if that was taken as the Government Laboratory standard?—From my experience of milk analysis, I consider it is impossible to look at one item in the analysis; we must regard the whole analysis together, and from the figures of the fat and the solids not fat, regarding them together you can form a more true and just opinion of the quality of the milk.

660. Then, taking 8·5 for the solids not fat, what would you take for the fat?—I could not take 8·5.

661. No, 8·5 you consider too low; would you take 8·8, say?—8·8 or 8·75, or something of the sort.

662. Would you consider that 3 per cent. of fat would be too high a standard for fat, knowing what you do of general produce?—Yes, 3 per cent. is too high. You see my difficulty?

663. The difficulty is mine, and that of many others?—I cannot look at any one figure. I cannot look at the solids not fat and say I will say that that is all right, because I must consider at the very same moment the proportion of fat.

664. Let us take the two things together: If I took a standard of, say, 12 per cent. of total solids, of which 3 per cent. should be fat, you would consider that that fairly represented what the cows of the country ought to yield if properly fed?—I should hope that they would give a great deal better milk than that.

665. You would not consider that too high?—Not for the milk of the country—certainly not. But I know thousands of milks that are not giving 9 per cent. of solids not fat, or are not giving 12 per cent. of total solids.

666. But if the Government Laboratory and outside private analysts could agree upon some such standard as that, it would be the means of checking a considerable amount of adulteration which goes on at present, would it not?—It certainly would.

667. (*Chairman.*) I should like to ask you to put in any figures which you have. You say the extent of the adulteration within your knowledge is very large, and I ask you, if you put in any figures, to show how you arrive at that statement?—I have not got any figures out as to the proportion of the adulteration amongst the samples that I have analysed. I have some figures here of samples that I have seen drawn from the cows. I have not thought that any other figures would be of any real value.

668. You say in your *précis* "the extent of adulteration practised in regard to milk is unquestionably very large"?—Unquestionably it is, because I have had an enormous number of samples that are adulterated.

669. You base that upon your own knowledge, and I ask you if you have got some figures out of your thousand cases a month which show that the percentage is very high?—No, I have not.

670. Have you analysed milk only from the city of London?—I have it through the post from all parts of the provinces, but principally from the south and west.

671. Who takes the samples for you to test?—Such samples may be from farmers or from milk sellers, or they may be duplicates from inspectors. I have my own man who collects samples at the stations from farmers' milks, who is always collecting some.

672. In fact, your samples come from all sources, and you do not know that they are drawn on any uniform methods?—Precisely; that is why I have given you no figures, because I do not consider such records are authentic. The figures that I can give you are from cows that I have myself personally seen milked, and known to be authentic samples.

673. These thousands of samples in your laboratory come from all sorts of places and are drawn in all sorts of ways?—Precisely.

674. No uniform method is adopted in collecting them?—No; I have a great many from farmers, a great many from milk sellers, and a great many duplicates from the inspectors.

675. You say yourself you adopt as your own standard that you think milk ought to come up to a total of 11·8, of which 3 per cent. should be fat—that is your own idea of a standard?—Yes, practically.

676. Do you really insist that you have this total of 11·8, of which 3 should be fat?—I can hardly say that; I must look at both figures together, and there is such an enormous possibility of changes between the two figures. Looking at the whole analysis together you are then able to get a fair idea of the quality of the milk, but you cannot, and I cannot, say it must always come to a certain limit of total solids or a certain limit of fat.

677. Still you told us that was your own standard?—It is a kind of guide.

678. That is the standard that guided you, generally

speaking, in arriving at a decision?—Yes, a kind of rough guide to have before me.

679. Then you told us also that you knew of a number of cases of genuine milk which did not come up to the standard either in solids not fat or in fat?—Yes.

680. What happens in those cases—how do you know they are genuine milk?—By seeing the cows.

681. You have actually been present when the cows are milked?—I have actually carried the case to the cow to find out.

682. Do you have a great many cases like that?—One perhaps is not called to a great many.

683. I rather thought you said you had brought to your own notice a large number of cases?—I have had a great many cases of that sort, where one has gone down and seen the cows milked, and found out that the cow was the offending party, and not the milkman.

684. In your opinion generally, how do you account for the deficiencies in these cows that you have seen?—In some cases I really cannot account for it at all. During the drought of last summer the cows seem to have been extraordinarily affected. I have previously discovered the same thing at other periods of drought. The milks from all parts—although not every sample of milk by a long way—seem to give a very high percentage of butter-fat and a very low percentage of solids not fat—in fact, if a man who had no knowledge of milk were to report upon them because there was a fixed standard he would say that all those milks were watered, but they were not watered in the least degree.—it was a natural effect.

685. Would the two together, the very high percentage of fat and the low percentage of solids, make up your ideal standard of 11·8 in these cases you have mentioned during the drought?—I do not understand you.

686. You say that in the drought every milk shows a very high percentage of fat and a very low percentage of solids not fat?—Some do.

687. Would the two added together make up your ideal standard of 11·8?—Yes.

683. Would they fall short of that?—No, they would be very much higher.

689. Say that your fat runs out in the bad time to 5 per cent., would you get the other solids not fat 6·8?—No, you would not.

690. Would the total solids come up to your ideal standards in droughty weather?—I think they would be higher.

691. Then there would not be any hardship in fixing the total solids of those particular cows at, say, 11·8 or even 12?—You are speaking about total solids?

692. Yes, including fat?—I have not given 11·8 as the total solids.

693. Your ideal standard is solids not fat 8·8 and fat 3?—I take, as a rough guide, say, 3 per cent. of fat and 8·8 of solids not fat.

694. And that guide, do you think, all round throughout the country should be adopted?—I do not think that for a moment.

695. You say that analysts ought to have a uniform standard—naturally you think your own standard the right one?—I think, when you are dealing with samples of milk on which a man is going to be convicted of fraud, there should be far more leniency allowed, and we must have absolute proof. I was speaking of a standard on which I was judging the farmers' milk; if a man is going to be convicted of course it would never do to take 8·8 of solids not fat.

696. It would not?—No. I know hundreds and hundreds of cases of milk that come below it.

697. But, if you add the fat to it, would you not get the right total?—No, you would not.

698. (*Mr. Barham.*) You say when a scarcity of milk exists the practice obtains in some quarters of diluting unsweetened condensed milk and mixing it with new milk—how do you know that?—I know it from samples that I have had sent to me.

699. Can you detect the unsweetened condensed milk?—You cannot detect it as unsweetened condensed milk, but you can detect it from your analysis.

700. Has a prosecution ever resulted?—I do not think so.

701. Do you not think it should? It is a fraud, is it not? I mean it is a foreign substance mixed with water which may be impure; that in its turn is mixed with new milk, and, therefore, takes the place of new milk; now, if that can be discovered by analysts, do you not think that some effort should be made in that direction?—Yes, if it could be absolutely traced.

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702. Do you think that that milk should be considered to be adulterated?—Yes.

703. Is it not very difficult to discover that?—If it is in exactly the right proportions it is extremely difficult, if not impossible.

704. I believe it can be done when there is a sufficient proportion, because of the coagulation of the albumen. I believe it can be discovered then?—Yes, I believe so.

705. But not unless there is about 20 per cent. of it?—Yes.

706. But you have discovered it from your analysis?—Yes.

707. I notice in your *précis* you refer to a small portion of gelatin being mixed with cream. That is curious; I have not heard anything of that kind before. You come here as a representative of the Dairy Trade and Can Protection Society—that is a rather large and important society, I think, is it not?—It is.

708. The most important in the metropolis?—I believe so.

709. It has a large number of members, and many of them are very influential firms?—Undoubtedly. I may say they are not only speaking for themselves, before this Committee, but they are representing also a great number of similar societies throughout the kingdom.

710. Have they suggested to you that gelatin should be added to cream?—No, I have not heard it from them.

711. And that the cream should be considered genuine afterwards?—No, I have not heard it from them.

712. That is a suggestion of your own then?—Yes.

713. Entirely?—Yes. I know that there are members who have it added, but I have not heard of it from the Dairy Trade Society.

714. But you know that there are members of that society who add gelatin to the cream; is that the case?—Yes, I have heard of it. I have been consulted upon the subject.

715. You astonish me. You still think that cream would be genuine if it had gelatin mixed with it in this small proportion?—I should consider it genuine, considering the purpose for which it is added.

716. You regard the gelatin as being necessary to be put with pasteurised cream?—I have understood that that is necessary.

717. For the purpose of thickening it?—Yes.

718. Could gelatin be put to raw cream for the purpose of thickening it?—Yes, it could.

719. Would that not cause a poor, thin, raw cream to have the appearance to the customer of being a rich, good cream?—I do not think that so small a proportion as a half per cent. would be sufficient to thicken it up.

720. May I read what you say in your *précis*:—"It is well known that cream subjected to pasteurisation becomes thin, and as the public insist on being supplied with a thick cream"—a thick cream, mark you—"a small addition of gelatin is not infrequently made, amounting to about 0·5 per cent."?—That is quite true, but then it is cream after pasteurisation—it is not because it is thin and deficient of fat.

721. True?—Cream before pasteurisation is thin because of a deficiency in butter-fat.

722. Exactly?—It would require far more gelatin to make it thick than it would after it had been pasteurised.

723. Is that so?—Yes, I believe so.

724. I should think that it was a mere matter of consistency; if you have two creams side by side, although one might be richer in butter-fat than the other, yet they would both be thin creams, and in order to thicken them you must set them as it were, and therefore this gelatin, I presume, must be added to it?—I have tested a good many samples of creams that have been pasteurised, and they are thin creams; and I have seen the same thing in the same proportion of raw cream; but with a half per cent. of gelatin added they are thick creams. We must have the proportion of butter-fat in. If the proportion of butter-fat is in then I say that the addition of half a per cent. of gelatin ought not to be regarded as adulterant, seeing that the man is putting it in not as a fraud and not to help himself, but to accord with the public taste.

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725. What I say is this, that if gelatin is allowed to be used for the purpose of thickening cream, it may be used, I think, for fraudulent purposes, inasmuch as an ordinary raw cream not containing a large amount of butter-fat could be thickened in that way so as to deceive the purchaser?—Yes, I daresay it could be.

726. Then it would be a fraudulent adulteration?—Yes, the deficiency of butter-fat would be a fraud.

727. That is your own view?—Yes.

728. Anyhow it is not the view of your association or the committee of the association that gelatin in any quantity should be looked upon as an innocent addition?—No, I do not think so at all.

729. Then a little further on you say:—"In the course of last summer the long continued drought affected the milk, as on previous similar occasions, by raising the normal percentage of fat and decreasing to an alarming extent in the light of a fixed standard the solids not fat"; have you any figures on that which you could hand in to the Committee?—Yes, I have taken three authenticated samples during the drought of August last year. In the first the total solids were 12·85, the fat being 4·5 and the solids not fat 8·35. The second showed 13·16 of total solids, 4·7 being fat and 8·46 the solids not fat, and the third showed 12·34 of total solids, 4·0 of fat and 8·34 of solids not fat.

730. That is not a very "alarming" extent, is it, if 8·5 is the standard of non-fatty solids?—No, if you are regarding 8·5 as the standard for non-fatty solids, but if you are regarding 8·8 as the standard for non-fatty solids——

731. Then it would be a large proportion?—Yes.

732. I think you have said you have an inspector who takes samples at the stations?—I have.

733. Have you figures with you of the results of those samples?—No, I have not.

734. Do you know how he takes them?—Yes, he takes them from the churn coming up by the trains as sent up by the farmers. He puts a plunger into the churn, plunges the milk several times, and also turns the milk from one churn into another, and then takes his sample.

735. In the result do you know any proportion in which it is adulterated; have you any idea of that?—I could not tell you the proportion; some are adulterated.

736. Not to any great extent?—Very rarely are there any large cases of adulteration.

737. Perhaps 10 per cent. is the limit?—Perhaps 10 per cent.

738. In cases where you have known the milk has come direct from the farmers and has not been tampered with at this end at all, have you communicated with the farmer or have your principals communicated with the farmer, and has the farmer said the milk was genuine and challenged you to come down and see the cows?—Yes, there have been such cases.

739. And although you have analysed the milk and have certified probably that in your opinion the milk was adulterated, yet afterwards, when you came to see the cows milked and tested it, you found it was quite pure?—That it was as given by the cows.

740. You speak of a change taking place during delivery; when the milk is sent out in a tall churn and it stands, as we all know for half an hour probably at the corner of a street, or what not, while a man may go round a certain neighbourhood, the cream—the butter-fat—is rising all that time, is it not?—Yes.

741. It is constantly rising?—Yes.

742. As a matter of fact, the "returns" you speak of in your *précis*—the quart or two or three quarts that may be returned to the dairy—is invariably richer than either the milk sent out or any sample the inspector can have obtained in the middle of the day?—Precisely.

743. Showing that in the ordinary procedure of taking samples by an inspector he does not really get what may be termed a fair sample of the bulk which the dairyman has sent out to supply his customers?—Very frequently that is so. I have many cases where an inspector has taken a sample from a carrier on the round; the proprietor sends me the duplicate that his man has brought back with him, as well as a sample of the milk which the carrier left at the dairy before starting on his round and a sample of his returns. Almost invariably I find that the inspector's sample is poorer in fat than either the sample he started with or the sample he brings back.

744. As a matter of fact, if milk was sent out containing exactly 3 per cent. of butter-fat, the sample the inspector would obtain would contain rather less than that in all probability?—Precisely; that is my point.

745. Milk coming up to a station stands at the railway station very frequently for some time—I do not know whether you know that—I do not want you to say anything not within your own knowledge?—Yes, I do know it stands a very long time—all night very often.

746. Would it be fair to take the sample from the top of that the next morning?—No.

747. It would be nearly all cream, would it not?—Nearly.

748. Supposing it stood for even half-an-hour, would there be any difference between the top and the bottom?—Undoubtedly.

749. We heard yesterday that while the milk was in motion—while it was on the rail—the butter-fat could not rise to the surface, or did not rise to the surface; would you think it fair to send to a station to take samples, and to take them, without stirring and without pouring out, even if it had not been standing at all at the station and had just come in with the train?—I am perfectly certain the cream would have risen.

750. I suppose you know of your own knowledge, from the samples you have had, that between the top and the bottom of a churn there would be a great deal of difference?—Yes; in fact it is a most difficult thing to get fair samples after it has once been put into a churn.

751. I should like to have that list that you have of the samples of milk that you have tested which were actually drawn from the cow in your own presence?—Yes. In the month of February of one year there were some extraordinary results of very poor milk. On the 10th of the month there was a farmer's milk which gave 11·25 per cent. of total solids, 2·46 being fat and 8·69 the solids not fat.

752. Would you tell us, in passing, what part of the country that would be from?—I am afraid I cannot tell you that in the case of that sample.

753. (*Chairman.*) Is that one you saw milked yourself?—No, this is not one I saw milked. I think you will see directly why I give you these; they all occurred in the month of February, and there were so many of them from different neighbourhoods, some of them being absolutely authentic, that I think it shows pretty clearly that at that time many of the cows were being peculiarly affected. That was on the 10th of February, and that was a farmer's milk, which, so far as I could learn, was an authentic sample—a genuine sample.

754. Can you tell us which year it was?—It was in 1897. On the 23rd February I had two samples taken from a client's own shed, when the results were—total solids 11·38 and 11·37, 2·6 of fat in both cases, giving 8·78 and 8·77 of solids not fat. There seemed to have been a great many samples of very poor milk about then, and, owing to having reported to one client that his milk was adulterated, he got the Middlesex inspector to take two samples from the cows and the duplicates of these samples were sent to me. The analyses were in one case 11·43 total solids, 2·58 of fat and 8·85 solids not fat; in the case of the other cow it was—total solids 11·25, fat 2·25 and 9·0 per cent. of solids not fat. On the 27th February another farmer's milk gave 11·4 total solids—2·6 of fat and 8·8 of solids not fat.

755. In the Middlesex case, was that a country milk or a town milk?—That was a country milk some distance out.

756. With a single cow?—Those were single cows.

757. (*Mr. Farmer.*) Do you know what breed they were?—No, I cannot tell you what breed they were. Of course, I am not putting these forward in order that they should be taken as any standard for the country to go upon or for milk to be judged by; but, knowing what milk can be, I say that it is impossible to have a standard, and it is unfair to my clients to have a standard that is fixed by law, and does not give them the option of proving how it is their milk is below the standard. There was a case I had in 1891, where I had been reporting milks from one farmer as adulterated for a considerable time, and the farmer always protested that they were not adulterated. I went down personally to the farm, which was near Swindon (at Hinton-St.-George), and the cows were milked in the afternoon.

758. (*Chairman.*) Would you say how many cows there were?—There were nine cows. It was not the whole herd, but those were nine cows which apparently seemed

to be the cows whose milk was sent up to this client in London. I had a sample taken from each cow. I was not the only one present there; the man who received the milk in London was also present, and, at all events, a practical dairyman who would thoroughly understand whether the cows were properly milked or not. The fat of each of these samples was 3·36, 3·64, 3·36, 3·56, 3·20, 3·76, 3·46, 3·35, 3·49; and the corresponding solids not fat were 7·90, 8·03, 8·24, 8·43, 8·48, 8·98, 8·24, 8·35, and 8·41. I had been reporting those milks as adulterated with added water, and I was horrified to find that the whole of this herd of cows, with the exception of one, were giving milk equivalent to added water—giving the same figure as though they contained from 5 to 10 per cent. of added water. Then I had quite recently (last month) some extraordinary samples which I could not understand. They came up from the country, and I suggested to my client that if those milks were genuine, as he declared they were, that he should get a local magistrate to have them milked in his presence, and certify that he had seen them milked, and send me up the samples again. That was done, and the results I should like to put before you as being extraordinary. Some were taken at one o'clock mid-day. The fats were 5·64, 5·94, 4·94, and 4·53, the solids not fat being 9·15, 10·13, 9·97, and 9·81. On February 19th, in the presence of the same magistrate, the morning milk was taken at six o'clock in the morning, when the results were: fats, 4·10, 3·80, 3·40, 3·50, and 3·40, the corresponding percentages of solids not fat being 9·66, 9·80, 10·21, 9·55, and 10·00.

759. All very good milks?—Most extraordinarily high in solids not fat.

760. (*Mr. Barham.*) Do you know whether they were Jersey cows or not?—I do not think they were Jersey cows. I know what their food was. They were being very well fed. Milk can vary to such an enormous extent as everything that affects the cow affects her milk; it can be very low or it can be very rich; and, therefore, I cannot see how it is possible to fix an absolutely hard and fast standard for any one ingredient. We must take the two together in judging of the quality of the milk by analysis.

761. (*Chairman.*) You mention a herd of nine cows, but you said it was not the complete herd; do you know how large the complete herd would be?—No, I am afraid I do not remember how large the herd was.

762. A large number, something like 60 or 70, would you say?—Something of that sort, I should think. The man was a large milk producer.

763. We had it in evidence yesterday that, taking a large herd, you would find about 15 per cent. would give an inferior quality of milk, but averaging the lot and mixing them all together you would get a proper standard, whereas if you go to a herd and pick out the worst cows you will get a result which will not come up to the ordinarily accepted standard?—Of course, but I know that cows are very often milked in a certain order. When they are standing in a shed, for instance, the cows will be milked in precisely the same order day after day, and the farmer does not wait until the whole of the cows are milked to put the milkings all into one huge vat. As each cow is milked the milk is turned into the churn, and directly the churn is full it is sent off and put on one side for the train. The cows are ranged in sheds according to their periods of calving very likely, and the consequence is that they get all the stale cows on one spot, and all those stale cows' milk goes into one churn, so when one speaks of a large herd of sixty cattle it must be understood that a mixture of that milk never obtains in practice; it is only the milk of a few cows that is ever mixed together.

764. (*Mr. Murphy.*) Do you give your inspector who collects the samples instructions as to how to go to work in the collection?—Precisely.

765. Do you think that if he complies with those instructions it meets the requirements of the case and enables a fair sample to be taken?—It is the best I can do.

766. I understand it is the best, but is the best sufficiently good to enable you to express an opinion?—Yes, I think it is. One cannot be far wrong; but unless the greatest care is taken in taking the samples, unquestionably the results are perfectly worthless.

767. (*Dr. Voelcker.*) You have mentioned that you represent your individual views with regard to the addition of gelatin; are they also your individual views with regard to the addition of boracic acid, or the views of the association?—The views of the association unquestionably.

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768. And also the views of the association with regard to the insistance on no standard?—Yes.

769. In the case of the individual cows that you have mentioned, where you reported them as being adulterated at first, and then went to see them, had you any evidence as regards the keeping of those cows or the feeding of those cows?—Yes, those cows were being fed on hay.

770. And cake?—No, hay only.

771. That is rather material, is it not; might that not in your view account for it?—The farmer himself was in a very unfortunate condition, but that is the fact.

772. But you would agree that when you find milk falling below that, and you find cows fed only on hay, it would be very advisable in the interests of the public that something should be done to ensure that the cows should be better fed?—Yes, I think they should be better fed.

773. And if they were better fed those that you found below the standard might very well have come up to the standard?—No, I would not like to say that. Of course these are only a few isolated cases that I have given you, and their number is legion. I have had very little time since being called to look up this subject.

774. Taking the milk of a number of cows, generally you could not very well raise it by good feeding, could you?—I think it is generally thought that the feeding has more to do with the quality of the milk than it really has. Might I put it in this way. You can by feeding raise the quantity of fat very much more readily than you can raise the solids not fat; in fact experiments that I have tried show that the solids not fat seem to be a very fixed quantity indeed.

775. You have mentioned cases where during the existence of a drought you found exceptional figures given; an analyst on reporting as to whether a milk is genuine would have before him the facts about the weather, particular seasons, and so forth, and any reasonable analyst would take those into account, do you not think?—I disputed one case, and had it dismissed on the score of the weather.

776. You yourself, before you reported upon an exceptional sample in an exceptional time, would take such considerations into account?—I should, but I do not think that a public analyst if he has a standard fixed by law will take any considerations into account. The public analyst's desire is to get a conviction, and he fights tooth and nail for it.

777. That I am afraid I must controvert altogether. Have you not told us already that it is common for an analyst to report a very much lower percentage of water as being added to milk, because he is afraid of putting himself in an awkward position owing to the existence of a low standard?—He has taken a low standard of solids not fat, I think.

778. Does that look as if he was very anxious to secure a conviction?—A low standard of solids not fat? No. I suppose he has taken that in self defence, no doubt.

779. Is it not very much more material to an analyst that his own credit should not be impugned than that a conviction should be secured through his agency?—Yes, of course it is.

780. Is it not much more likely to be fatal to his reputation that a mistake should be found with him, or that a brother analyst should upset his verdict?—Of course that would be a very serious matter indeed.

781. Is it a fair thing to say that the desire of the public analyst is to secure a conviction?—It would appear so from one's experience; that is all. A public analyst ought not to be placed in such a position. The refutation of his opinion upon a commodity such as milk ought not to be detrimental to his professional position.

782. In the cases that you have mentioned of milk being taken as it goes its rounds, and of samples differing through differences in analyses, do you know of any cases where injustice has been done?—No, I do not think I do.

783. Then it is not very material?—It is in fixing a standard. It seems to me it is quite essential if you are thinking of the quality of milk that you wish to have supplied in the country—that is one thing to have a standard for; but a standard by which you are going to convict for adulteration is quite another thing.

784. If no convictions have followed from the analyst's analyses of the poorest sample of them, in which he has taken admittedly a low standard there cannot be any very great harm in fixing an average of the better samples?—But the difficulty is this that even now, with your stan-

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dard, the result is that the dishonest man is watering his milk. I could tell you the names of men I know perfectly well who are making a practice daily of watering their milk down to just pass that standard.

785. Then you are generally in favour of raising the standard rather than in favour of lowering what has been believed to be the present standard?—My own personal feeling in the matter is that the standard should be raised, but not to have it as a legal standard, fixed by law, so as to give no honest man a possibility of getting out if he is caught. A milkman must have a right of proving his innocence.

786. You would raise it and put no force on it?—It is extraordinarily difficult.

787. (*Mr. Farmer.*) Have you considered that the section says that it only raises the presumption "until the contrary is proved"?—I know; but when that works out the magistrate will say it is below the standard. That will be his point; is it above or below the standard; it is below the standard, therefore a conviction takes place. That is totally unfair to my clients, who may be perfectly honest, and yet their milk may come below a fixed standard, if a high standard is adopted; if you have a low standard of solids the result will be that the dishonest trader is the only man who will benefit; he wants to have a low standard fixed in order that he may water down; and with the standard that is adopted now it is being done.

788. (*Chairman.*) Supposing no alteration takes place the same watering will go on for ever?—It will, and you cannot catch the man. They are the men who are far greater rogues than the men who water occasionally to a larger extent, and get caught.

789. Standard or no standard, the same thing will go on; there is no standard, so to speak, fixed now by law?—That is so.

790. And watering goes on to a great extent?—Yes.

791. If you fix a standard by law you say the same thing will occur, so it will not make matters any better or any worse?—Precisely so; if you fix a low standard.

792. (*Mr. Barham.*) You say that no injustice has ever been done to a dairyman through an unfair sample being taken in the course of sale; you have also said that when milk is served from the churn the last portion is the best. Supposing milk is dipped from a vessel on the counter, in the ordinary course of business, and by an ordinary servant, would not the butter fat be sold more largely in the first portion than in the last portion?—Yes, undoubtedly

793. Have you ever heard dairymen complain that the inspector has obtained a sample nearly towards the end of their sales?—Over and over again.

794. And they have been summoned for a deficiency in butter fat in consequence?—Over and over again.

795. Would you consider that an injustice?—Yes. I am afraid I forgot the counter-pan; I was thinking of the carriers' samples.

796. It has arisen over and over again, has it not?—Many times it has arisen.

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Mr. JOSEPH BEECROFT, called; and Examined.

797. (*Dr. Voelcker.*) You are a dairy farmer in Cheshire I understand?—Yes.

798. You are a producer of milk, cheese, and butter?—Yes.

799. And you have had a great experience of it?—Yes.

800. You are aware of the natural variations in the quality of milk?—Yes.

801. And you consider on the whole that it would be desirable to fix a standard for milk?—I do.

802. Provided that standard is not too high?—Yes, that is so.

803. You also consider that it would be undesirable and unnecessary to fix any standard with regard to cream?—Yes, I think so, for the reason that is expressed in my synopsis.

804. You think that the standard for milk should not be high, because it would act unfairly to farmers who have not very good land or very good material to give to their stock?—That is so.

805. Land varies a good deal, and the quality of the milk produced on that land would vary also?—Very much indeed.

806. You also think that the conditions as regards the cows, their age, their breed, the length of time after calving, the season of the year, the time of day and the food that you give would produce natural variations which would cause the quality to vary?—Certainly, very much so; I take it from my own experience.

807. And would involve difficulty in fixing a standard fair to all parties?—Yes.

808. In the end you suggest that if a standard be fixed at all it should not be too high a one, and that there should be a reference to the individual farm or individual animals that were called in question before any conviction shall follow?—Yes, I think that is very necessary.

809. Those are the general views that you wish to express?—Yes.

810. Just let me ask a question or two upon them. You say in your précis that the milk of cows is very rich two or three weeks after calving; that is not the time when the milk is the richest of all, I believe?—No, certainly not.

811. You agree that it is an advantage to have a standard?—I do.

812. And you consider as most material the standards with regard to butter fats?—Yes.

813. You suggest that many towns give an average of about 2½ per cent. of fat only?—I give you, I think, the figures there with the variations in the different towns. With the majority of those 16 different towns the standard is 2·75.

814. And that, you suggest, is quite high enough?—Quite.

815. May I ask what statistics you have to go upon in fixing 2·75 as the average of the supply of towns?—The only idea that we have to go upon in judging 2·75 to be a fair average is that it has been adopted by the majority of towns, and by the amount of people that have been summoned we have found that it has been taken as a basis of being fair. Moreover, there is my own experience on my own farm, which is 350 acres in extent. The quality of the dairying land upon that varies. I am quite sure that I have land that even with high feeding would not produce milk of more than 2·75, whereas I have land that would produce quite up to 2·75 without high feeding. To be fair to all, in a county like ours, that varies so very much in soil, to fix a high standard would be very unjust. I feel certain that would be so even in our own district. I have land on my own farm that would not produce milk containing 2·75 per cent. of butter fat without my cows were highly fed.

816. What do you go upon to know that the milk of certain parts of your farm does not produce above 2·75 per cent. of fat?—The result of the weight of cheese and butter manufactured from the milk.

817. You will not tell me that you could tell whether you get 2·75 per cent. or 3 per cent.?—I should know whether it was a paying concern or not as regards weight.

818. There is always what they call the "make weight" I think in that, is there not?—Yes.

819. You have, I take it, really nothing very definite—I do not expect farmers generally would have, but as the analytical point is bound to come up here I must put it—to show that 2·75 is the quality of the milk produced on your farm; it is a general idea that you have got that it is not quite up to 3—it is nothing more than that, is it?—No, I do not say that it is.

820. You would not put too much importance on that?—What I mean to say is this, by fixing the standard at 2·75 I think you would be fair. I have not a doubt of that, judging by my experience of milk sold, which extends to nearly 30 years. Some portion of that time I have sold all, and I have always been a seller, some portion of the year. I have perhaps been in a fortunate position; I have never been summoned or called to account for my milk during that time. I think that portion of my farm that I do dairy upon undoubtedly does yield milk quite up to 3 per cent. But I put it to you strongly that we have such a great number of farmers that farm on land not producing up to 3, so that to put the standard high would not be fair.

821. You do not know that it does not produce 3 per cent.; that is a general idea only?—I think we know it from the result of people who have been summoned, and

their milk tested and proved, not to be up to the 3 per cent.

822. You have nothing in the way of statistics from the different farms?—No, I have not.

823. It is simply from individual cases?—Yes.

824. Where people have been summoned have the samples been taken direct off the farm, or are they samples that have gone by train and passed through the hands of retail vendors, and so forth?—Some of the samples that have come to the knowledge of our Association, and that we have taken up, have been taken up by Liverpool or Manchester, and have been found not to be up to the standard of those towns, and when the cow has been appealed to it has been found that it has been pure milk, and the convictions have been quashed. That is our point, that the standard adopted by these towns is too high.

825. You have had a reference to the cow?—Yes.

826. You would not consider it any hardship if a standard were fixed, and that standard was put simply as an indication for drawing an inference that something was amiss with the milk, and there was subsequently a reference to the farmer or the cow?—Certainly not; not if that took place before conviction.

827. Then with regard to the quality of the milk of these 16 different towns of which you speak—that information depends upon general belief, too, does it not?—I have figures here that have been compiled of the standards fixed by the various towns.

828. But that table will not give the general composition of the milk supplied to those towns, I suppose?—No, it does not; it merely gives the figures.

829. We have already in evidence the quality of the milk supplied to such a big town as Birmingham; we all know Cheshire is a very fine dairying country, and I do not suppose that the neighbourhood of Birmingham is very much superior to that of Cheshire, is it, from a dairying point of view?—No, I should not say it was.

830. Perhaps rather the other way, is it not?—No, I should not think so. There is some very good land in the neighbourhood of Birmingham that I have been over.

831. And there is some excellent land in the neighbourhood of Chester?—Some almost as good as anywhere I should think, but, as I say, we vary a very great deal in quality.

832. Then you tell me that you have got some poor land which you have an idea does not produce milk with 3 per cent. of fat?—Yes.

833. If the standard were fixed at 2·75 you would feel pretty sure of being out of any trouble, would you not?—No, I should not. Another reason why I should not try to supply milk from that land.

834. Yes?—That is what I am bringing you to. I do not think I should either get the quantity or quality from that land without a great deal of extra feed, and by turning it to other accounts; probably it does much better for me with less expenses, and pays better than trying to produce either milk or cheese from it.

835. (*Chairman.*) You would not use it for cheese?—I should not use it for either cheese or butter; I put sheep upon that land now. I would like to say the reason why I would not do this is that if I was to try to either manufacture butter or cheese from it the cheese would be poor in quality, and I should not get the weight, for the simple reason that I should not get the amount of solids in the milk off that land that I could from stronger land.

836. (*Dr. Voelcker.*) That is looking at it from the point of view of whether it pays you as a farmer; you will allow that there is also another point of view that we must look at it from, namely, the quality of the milk supplied to the public generally, and you would be quite willing to admit, would you not, that it would be better for the well being of the community at large, that milk of a good quality should be produced, and that it should be obliged to be produced?—Certainly. I am in favour of good milk being produced, so that the farmer does not suffer by the fixing of a standard that is too high, and also so that there is a chance of appealing to the cow.

837. Then is it quite right, in your opinion, that a standard should be based upon the milk produced upon land which admittedly is not very good dairying land, and not particularly well suited for the purpose?—Not solely. I do not quite understand how you put that question.

838. Is it quite right that you should take as the standard of milk for the country generally—of milk which is to be suplied to the public—the quality of milk produced by land which admittedly is not good dairying land?—I should say certainly not. I think it ought to be arrived at on a different basis.

839. Then as you have got some of this poor land which you are pretty sure produces 2·75, we should not be very far wrong in saying that better milk than that ought to be produced in the country?—I do not think that mine does produce 2·75; I never said so yet.

840. Still if you had samples tested they might have all come, you know, to 3 per cent.?—I am sure it would not.

841. Even on that poor land?—I am sure it would not.

842. But it is only an idea you have?—It is one I am quite certain of. Practical experience will go beyond theory.

843. Anyhow, you would admit that if you had got this poor land and tried to produce milk off it it is very much like a farmer trying to grow wheat on land that is not suitable for it?—Yes, comparatively speaking it is.

844. So that in judging what sort of milk the public is to have you might very well exclude such land out of consideration?—Yes; if you get at a fair figure for the percentage of what that land would produce; but you must not take it that I have got any idea in my mind that it produces 2·75, because I know it does not.

845. You have told us as nearly as you can, perhaps not clearly enough for the analytical mind, what percentage of fat this land produces; can you tell us with equal accuracy what amount of total solids, or solids not fat, the land produces?—No, I could not.

846. You have no idea?—No.

847. And you have no views as to whether solids should be taken into consideration or not?—No; I have not gone into that.

848. In fact you will not put too much stress upon the figures that you have mentioned here?—No.

849. You mention too that cows will give a milk richer in butter fat in the evening than in the morning, and that the variation is as much as one per cent.?—Yes.

850. We have had evidence on this point too. I suppose you will not rest too much on that one per cent. either; you would not be surprised to hear it was only a half per cent.?—I have figures that have been compiled very carefully by our secretary, who is in the room, which show that in a stock of 32 beasts it is possible.

851. But you would not be surprised to hear that the average perhaps is only a half per cent.?—No, I daresay not.

852. That you would not put too much stress on. Then you tell us in your synopsis that "food soft and forcing of a non-nitrogenous nature," by which, I suppose, you mean starchy foods like meals, and so forth?—I mean mash food, such as brewers' grains—mixed mash food.

853. "Food soft and forcing of a non-nitrogenous nature would have a tendency to produce a milk poor in solids, whilst highly concentrated food would have the contrary effect." Is that a point of practical experience, or is it just a general idea on your part?—It is only practical experience in the way of dealing with my own milk. I find if I force milk, the yield from it, either in butter or cheese, is not as good as when I get a steady flow by good, sound feeding.

854. You hint that there should be a reference to the farm and to the cows implicated where milk is shown to the poor in quality, and that a hint should be given to the farmer, if it does come below that, he has got to push it up a bit; you admit it is quite possible for him to do so?—Yes, I think it is in many cases.

855. Then there would not be any very great hardship in a standard being fixed which they all could push up to without any particular difficulty?—I think there would because if it was fixed too high a difficulty would arise in the expenses. The expenses would run away with the income to such an extent that he could not afford to do it. A man has to live by his means.

856. If we took your land at 2·75, and a visit was paid to you, and they told you to put it up to 3 per cent., you could do it well enough?—I think I already turn the milk out at 3 per cent. off that land which I do dairy from.

857. About the other solids you would not express any opinion?—Why I would like to put strongly before this Committee our idea for 2·75 is this: we do not consider it fair at the present time that there should be no standard and that the Corporation's analysts should have the fixing of a standard of their own, because it is not dealing fair any more with the public than it is with the farmer.

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858. A variation of standard is very objectionable?—Very, I think.

859. And it would be well if a general understanding were come to?—Certainly.

860. Provided that injustice were not done to the farmer thereby?—Yes, I am quite sure of that.

861. Practically you think that if we agreed on, say, 3 per cent. of fat, yourself and other farmers could very well come up to it?—I do not think so all round; I think it would deal very hardly with some farmers.

862. Can you give me any cases in which anybody has been dealt hardly with, or is it only a natural desire to be on the safe side?—We know they have been dealt hardly with by being convicted, and when they appealed——

863. Yes, those milks that had gone to Liverpool, and had gone through the hands of porters, guards, drivers, and everything?—That is so; but I do think it would inflict a very great hardship upon farmers generally to fix it at 3 per cent. of butter fat.

864. Still your land does it—even that poor land?—If the farmer had to bring it up to 3 per cent. undoubtedly the expenses entailed upon him would be so great, over and above what he can get for his milk, that it really would not pay.

865. Still there ought to be a standard?—There ought to be a standard.

866. In order to check people?—Yes, but I think the standard should be carefully compiled, taking all the facts into consideration.

867. You would allow, would you not, that if the standard were fixed at 2·75 there would be considerable difficulties with the man who had rich lands. I have relations near Chester who have got some very rich land that I should say produced more like 4 per cent. of fat. I do not say my relations would, but might not some people, be tempted to water that down to make it 2·75, the same as yours?—I do not think they would attempt it, but I would say this, while you are on this point—it has been a very strong feeling with me for many years, and I do really believe, that milk which goes into the dairyman's hands at the present time, over 3 per cent. does get tampered with; and if anyone has the right to tamper with it it is the farmer who produces it—that is the gentlemen that ought to have the privilege.

868. I think we have made a material advance with your evidence. It is very clear, from what you say, that a standard above 2·75 would be desirable to prevent some of these gentlemen doing it?—I do not say that. I think if you take as a basis the whole of the towns and the convictions that have been brought before us, and the way in which they have proved it, you will see that 2·75 is about a fair thing. I do not come here, gentlemen, arbitrarily to say 2·75 must be the sum, or below 2·75, but in fixing a standard which I do think is very necessary, and the majority of my chamber are very strong upon that point—I say it should be compiled upon a basis of figures, taking every point into consideration. If you find by taking in weak land, strong land, and land of various qualities, that it will come up to 3 per cent., I say put it at 3 per cent.; but if you think a man would be placed in a false position by fixing it at 3 per cent., and the expenses which would be entailed upon him in bringing his milk up to 3 per cent. would be greater than he can bear, to make a living off that, then I think it wants fixing something below 3 per cent. That is my point.

869. But you admit at the same time that it is very desirable to keep out the man who brings it down to 2·75, if it was originally more?—I am not quite at home on that point, for the simple reason I do not know to a point what this poor milk will yield; but I do go this far, that the public ought to get a good substantial article supplied to them.

870. Would you call it a legitimate thing for a farmer who had a milk giving 4 per cent. of fat to water it down to 2·75?—I say that if he produces a thing above the standard, if anyone has the right to tamper with it, it is he. I think the same thing should apply to milk as it does to other things. I suppose if we go to buy whisky we buy it so much above proof, and when it is in bond, if it comes out so much above proof, do they dilute it down or not?

871. In those cases the shops put up a notice that all spirits sold in these establishments are diluted; unfortunately the farmer does not put up a notice that all milks sold off his place are diluted?—If he put up a notice that all milk sold contained 3 per cent. of butter fat, it would be the same thing. There is no reason why he should not be able to do that.

872. With regard to the cream that you have told us has a very variable composition, and it is hard to make any standard for it. Are you a seller of cream yourself?—I have been a seller in small quantities, but nothing worth speaking of.

873. When you do sell it do you put a preservative in or not?—No, I sell it in its natural state.

874. Is it wrong, do you think, to put any preservative to it?—I do.

875. But it is not wrong to add water to milk?—If you add water to milk you do not add something to it which is dangerous to the consumer, and we are told by medical authorities that what they add to it as preservative is.

876. If it is like some waters I have analysed in Cheshire I should think it would be decidedly dangerous; they are not all good waters there, are they?—No, they are not, and they are very short of water in some places, too.

877. You know there is a great difficulty in keeping cream?—Yes, for any length of time.

878. A little bit over the top keeps it, does it not?—I have never tried it, and so I could not say. I never have tampered with what little I have had in any shape or form.

879. Do you think it would be desirable not to allow the use of preservatives in cream at all?—I think so. I think if a person demands a thing as cream he should have it as cream, and nothing else. It is a fraud I think to sell cream to anyone adulterated with anything.

880. But you do not think it quite on the same lines that milk should be sold as it comes from the cow?—Only on the points I put before you; I should go on the same line again; it is no use quoting the same thing over and over again, doctor.

881. (*Major Craigie.*) You are representing an association called the Cheshire Milk Producers' Association?—Yes.

882. Is that a large society?—It consists of about 800 members.

883. How long has that society been in existence?—A little over 12 months.

884. Has this subject which we have been discussing to-day formed a subject of discussion in meetings of the society?—Yes, we have had a special meeting almost for it.

885. Have any resolutions been passed by the Association which you could put in before the Committee on the subject of the milk standard?—Yes.

886. Have you those with you?—No, I do not think I have.

887. In your *précis* you refer to the number of towns in which the standard or the assumed standard of butter fat varies from 2·50 to 2·75; would you be able to put in a list of the towns in which the standard of butter fat is assumed by you to be 2·50 only?—I did not quote the very lowest I had for the simple reason that I thought you might think I was advocating it. There is one as low as 2·6 of butter fat, that is Bradford. Then Middlesbro' is 2·50, and the majority is 2·75.

888. (*Chairman.*) 2·6 is higher than 2·5?—Yes, I beg your pardon, it is.

889. (*Major Craigie.*) Middlesbro' is 2·5 and Bradford 2·6?—Yes.

890. Have you any evidence on the price of milk in these different towns. I mean the prevailing price at the present time?—It varies.

891. That is rather an important point. Is the price of milk in those 16 towns that you have mentioned widely varying or not?—I cannot speak to the 16 towns.

892. Not all, you mean?—No. They vary in Manchester, and in Liverpool, and in Birmingham. Would you like me to give you some idea of the present prices? The price advocated as a minimum price in Manchester for the ensuing 12 months, that is, by the milk dealer and the Farmers Association, is sixpence for six months.

893. I want the retail price?—I could not answer you as to the retail price; I am not at home in that.

894. You are giving the price for the producer?—Yes.

895. With reference to the same towns, taking those at the lowest standard, have you any actual cases of prosecution recently in those towns; have there been any prosecutions at those low standards?—No, but they are not fixed so low as this. Manchester deals very fairly with us now at the present time. If they find a milk is bad, or that does not come up to their supposed standard, they visit the cow; they appeal to the herd before prosecuting.

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In Liverpool they do not. The milk that would pass in Manchester would not pass in Liverpool, for instance. That is one reason why we think it is so necessary to have a standard, so that the farmer should be dealt fairly with as well as the public. If a man likes to tamper with his milk, for instance, as was suggested by Dr. Voelcker, by adding water to it if it is above the standard, he would be able to send it to Manchester, but not to Liverpool; and we do not think that is right. While we are on this question I would like to let you know that I do not advocate poor milk by any means. I believe in a fair, good, sound milk being sold to the public. What we advocate a standard for is that everyone should be dealt fairly with, and that we should not be under that great stigma of conviction when we do not think it is really necessary.

896. Referring to the Association of Milk Producers in Cheshire, can you give us any idea of the extent of the herds belonging to the different chief sellers of milk in your district or in that Association; do they keep large herds or small herds?—They vary I should say from 20 cows up to 100. I myself sell milk from 46 cows.

897. Would that be about the average milk seller's herd?—I should say, taking the average milk seller, it would run from 30 to 50 cows. Many of our small holders make a very good article in cheese, and they really only sell the milk in winter; but those that go in for selling the milk through the year I should say make it with from 30 to 50 cows.

898. Referring to what you say about the practice in Manchester, in paragraph 7 of your *précis*, do you suggest that there should be some intermediate step between the taking of the sample and the actual prosecution?—Yes, certainly.

899. In every case in which there is a suspicion of poor milk you would suggest that some preliminary step, not a public one, should be taken with reference to the producer's own herd?—Yes. I would like to say, if I might be allowed, I heard yesterday, or this morning rather, that you had evidence placed before you that there was no such thing as a pure breed Dutch bull kept in Cheshire. The cattle I supply my milk from is the only stock of cattle that are bred on one line in Cheshire. I have had a pure-bred Dutch bull in my stock, and I have crossed it with the cross-breed Shorthorn and a Dutch bull twice over. I am now breeding back again for certain reasons. I thought it was only right to say that having heard this had come to your knowledge as a committee, I have never got quite as rich milk from the cross, but I have got more, I am quite certain of that, than I have from the ordinary cross-bred cow. I found out from experience that they were not hardy enough to stand our neighbourhood without great care. I found that I had to calve them earlier in the back end of the year, and I had to be a little more cautious in the turning out in the spring. I thought, knowing that breed does affect milk, both in quantity and quality, that it was only right I should intimate to you that these cows had been bred from a Dutch bull, and that I had bred them myself.

900. (*Chairman.*) How old was your bull?—When I purchased it do you mean?

901. Yes.—I purchased it as a yearling from Lord Egerton of Tatton.

902. Is he keeping up the breed of Dutch cows?—Yes. How I happened to come in touch with them was this: I was appointed a judge at his lordship's private foal show, as I go in for horse breeding, and knowing his agent I was asked to go and spend the greatest portion of the day with him, and to go through his various herds. He has three small herds of cattle, and I was very much struck with these cattle as being very fine beasts, carrying good formed udders, and I also found from a record kept by his lordship that they were the heaviest milk producers he had on his own farm. That at once told me that it was a good thing to cross my cattle with, and I tried it. I hope you will excuse me detaining you just a moment on this; I thought it was only right you should know it has been tried.

903. (*Mr. Cowan.*) You state you have had to do with dairying for about 30 years?—That is so.

904. Do you think that there should be any difficulty in getting milk up to a 3 per cent. standard?—I do on weak, poor land.

905. Have you some of that land?—I have.

906. I gather from what you said that it might be better applied to some other purpose, such as putting sheep on it?—If I were situated as some men are, close to a railway station, and close to a town with my whole farm, and was not over particular, I should certainly go in for producing milk from it; but in my case and for my farm I maintain that having two or three different classes of land it pays me best to turn it to the account that I do.

907. At the same time you say you think there is no difficulty in a healthy, well-fed stock producing up to 3 per cent. of butter fat?—Not on good land. I should say you would have a difficulty, and the difficulty would be a hardship to the tenant, where he was compelled to produce 3 per cent. of butter fat off poor soil through his extra expenditure in food stuffs.

908. Do you think it is fair to the consumer that milk under 3 per cent. should be put on the market? You have been taking it from the producer's point of view, but look at it from the consumer's point of view. You allow there is no difficulty in fair land of getting up to 3 per cent. of butter fat; would you say that the farmer who does not feed his stock well enough up to that should not be allowed to put his milk on the market—that it would not be genuine?—I think he ought to have the chance before conviction, that he should have that called to his knowledge so that he could please himself.

909. So that he could either go on producing from that poor land or turn it to another account?—I think that is a very good suggestion—before conviction.

910. Do you not think if there is a standard fixed, and a fair standard, that anyone producing milk above that would be likely to get a higher price, according to the quality?—I am afraid not at the present time. If that was so, if we could rely upon milk being sold by quality, and not by quantity, I would advocate the highest standard you could put it to; but being as it is now, when we do not get paid according to quality, when we only get paid according to quantity, I maintain that to be fair all round a standard should be fixed to cover every man, so that he should not suffer in any way harshly. I take it that if I supply milk in bulk, and I can bring that about by feeding by one means I have a perfect right to do it; but I consider that the other man who cannot get milk up to that standard without extra feeding wants protection. We want to be dealt fairly with just as much so as the public do.

911. (*Mr. Murphy.*) I understood that you were going to put in that list of 16 towns in which you say you have ascertained the standard?—I have that here, and I can leave it with the Committee for their private use, if desired.

912. I assume that the Association you represent is aware that a local authority has no power to forbid the sale of any particular milk in its district, as suggested at the bottom of paragraph 7 of your *précis*?—Yes, that is so. I do not think they have that power, but we think it wants strongly impressing upon you that where a milk does not come up to the standard—and we trust you will fix one; I hope so, any way—that they should have power to appeal to the herd before conviction.

913. (*Mr. Barham.*) You mean before prosecution?—Before prosecution. Farmers of position are desirous of always producing a good article, and I think it is a great shame that men of good repute, when they do the best they can, should have their names dragged before the public in the form that a good many have.

914. You represent the Cheshire Milk Producers' Society, I believe?—It is so.

915. That is composed of 800 members, is it?—Yes.

916. I understand you come here to voice the views of that Association?—Yes.

917. They are milk producers in the sense that they produce milk for sale very largely?—Yes.

918. That is why you are interested really in this inquiry?—Yes.

919. Is it your opinion and their opinion that the standard for butter fat should not be fixed higher than 2·75?—There has been nothing definitely settled on that point. Their general opinion is, I may say, not quite unanimous, but strongly in favour of a milk standard, and that it should be based upon a fair basis, taking into consideration the facts that we have laid before you.

920. So far as they are concerned, with a view of preventing the unjust prosecution of innocent men they would suggest that the limit should be 2¾ per cent.?—That is so.

921. Now you have some figures with you, I think you say authenticated figures, showing that the difference of butter fat between the a.m. and p.m. meal amounts to one per cent.?—Yes.

922. You are quite clear about that?—Quite clear.

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923. Now, referring to the milk of Liverpool, in reply to Dr. Voelcker's questions about the milks which resulted in prosecutions being taken at Liverpool, I think you made it equally clear that that milk had been traced to the cows, and had been proved to be of a quality such as they would prosecute for, but all the same it was genuine milk?—That is so.

924. Your grievance is that the present standard has resulted in prosecutions for selling adulterated milk when the milk has actually been the genuine produce of the cow?—Just so.

925. Then you mentioned the average number of cows held by each farmer, and I think you said it is probably about 40 or 50, but then you went on to say that most of the small holders made cheese, and that they sent their milk to the towns in the winter; how many cows would those small holders mostly keep?—We have a fairish number of small holdings in Cheshire.

926. I thought so?—I should say our small farms vary from about 20 to 50 acres; and on those farms, where they produce cheese they feed very heavily, and keep as much stock as they possibly can have. But I really could not lay down the number of cattle. According to the farmer's ability, possibly he might keep 20 or 25 cows.

927. Not on 20 acres, of course?—No, not on 20 acres, but I am quoting from between 20 to 50.

928. It is a little bit beside the question, because we have not got the power of recommending municipalities to give the notice you suggest; but would it not be almost a greater punishment to a farmer to be forbidden from sending his milk to Manchester than it would be to be fined £5 or £10?—No, I do not think so.

929. You do not think the losing of a market such as that would be a greater punishment to him?—I think it is a great punishment to a farmer to be convicted of doing what he has not been really proved to do, and to be branded with it amongst his brother farmers when he has brought out the best article that he possibly could, and when he has no reason of his own that he could say "I could have done different."

930. You think a farmer would feel that very acutely?—I do.

931. It is not the loss of money altogether; it is the loss of his good name?—Yes. I value my good name more than I do all the money I have got, if I may put it as from myself.

932. If too high a standard is fixed you think it would result in many more farmers suffering from the same cause?—I am sure of it.

933. (*Chairman.*) In connection with the Liverpool prosecutions which have been quashed they have taken samples from a particular churn as regards Cheshire, and they found them below the standard recognised in that town?—Yes.

934. They have then gone to the farm of the producer, and there had it proved that that milk was genuine?—That is so.

935. Do you know an instance of that?—Yes, I have a case with me. Did I understand you to ask me whether that referred to the cases at Liverpool?

936. It was Liverpool that you mentioned, I understood?—No, Manchester. In Manchester they always appeal to the cow if it does not come up to the standard that they suppose is the fair standard. In Liverpool they do not give us that chance.

937. We will say Manchester; it does not matter. When you went back to the farm did they milk the whole of the cows in the particular herd, or a single cow?—I believe they milked the whole of the cows.

938. And the whole of that herd, you say, produced milk of as low a standard as 2·75?—Yes, that was so. Our secretary says what I say is perfectly right, but we have not got evidence of it to put forth.

939. Your contention is that the standard should be fixed at such a height as to admit of the cows that are fed on the poorest and worst lands in Cheshire—that is what it amounts to, and you wish, in supporting this statement to say that in cases where prosecutions have been started, examination has been made of a particular farm where the milk was supplied, and it was found that that milk really and truly came from the cows of that herd?—Yes.

940. Therefore you say the standard should be put at such a height, or the reverse, whichever you like to call it, as to admit of the cows that are fed on the worst lands in Cheshire?—Yes, and I think when that standard is arrived at—I should like to put this forward strongly—in arriving at that standard it should not be a standard taken from that very poor land, but it should be based on a fair thing to give what would be a fair standard, so that that farmer should have a chance, probably at slight expense, of getting his milk at something like what it would pay to produce it, and not for it to cause him to have an over expenditure to produce up to a very high standard. If you take the very best land in my neighbourhood to fix the standard on that would be very unfair as against the poorest. I think the whole thing wants closely considering, and the basis of the standard should be formed on the majority of cases that you have laid before you.

941. I quite understand what you say. I want to arrive at this: You being a milk seller yourself are quite satisfied that a certain amount of land on your farm will produce such inferior milk that you do not use it for that purpose?—That is so.

942. Is it not the case that with almost all these other milk sellers in Cheshire that you are referring to, they are employing land for the production of milk which you as a practical farmer would not use, because you have a higher standard in your own mind than possibly they have?—Yes, that is so. There are, no doubt, farmers situated in that way.

943. There are farmers really and truly whose case, although you really implied it, we could not consider—that is to say, we have not to go down to fix the lowest depths to which milk can possibly fall?—We do not wish you to fix a standard just to cover these poor farms, but we want that whatever standard may be fixed should be a fair one, to give these men a chance of appealing to their herd, so that they should not be convicted of selling an inferior article when they have no control over it. That is the great point we want to put forward. We are strongly in favour of good milk being sold to the public generally.

944. I think we are all agreed upon that?—That is our general feeling.

945. You say yourself you never really have had an opportunity of knowing what milk you do produce?—No, I never have.

946. Nobody has prosecuted you, or put you to the test?—I have had no trouble whatever, and I have not had my milk tested.

947. (*Dr. Voelcker.*) In reference to the land of which you speak as being inferior the circumstance which led you to use that it is that it is near the station, and when you are so placed that you can send milk well into a town the tendency is to take any land that there is and turn it into dairying land if you think it pays?—That is so; there is no doubt. I might say in reply that one thing that has a ruling weight is that anyone who gets milk close to a town gets an advantage of at least 2d. a gallon through it going in warm. If he has to put it on the railway once you get on the railway you get railway milk, and you have to be content with those prices.

948. Your chief consideration is producing quantity off that farm rather than a particular regard to quality?—No, it is not. I think whether it be poor or not a fair quality should be produced off it.

949. I say your main consideration is to produce the article which will sell well?—Certainly.

950. Without having particular regard as to whether it is very rich or not?—I draw the line there. I do not think we should be doing justice to ourselves to advocate that.

951. I will take you from the land to the cows. Lord Egerton has this herd that I have seen; the chief consideration in favour of the Dutch cow as a dairy animal is that it is a heavy milker—that is why people use them, is it not?—I am not in a position to say that.

952. You do not get them for the goodness of the quality?—I do not know what the quality may be.

953. Do you happen to know that the quality of the milk that Lord Egerton has had from the pure Dutch cows—I am not speaking of the crosses, but of the Dutch cows that were brought over—was uncommonly poor, and that many of those cows would have found themselves in a police court if the milk had been analysed?—At the same time are we to suppose that the Dutch cow in Holland is to give the same quality of milk as the Dutch cow in England.

954. We are not speaking of the Dutch cow in Holland?—You are advocating that the Dutch cow gives poor milk.

954.* I put it to you that the introduction of the Dutch element in your herd, or the inducement for it, was the

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production of a big quantity of milk?—To improve the quantity of milk I will put it.

955. The quantity of milk?—The quantity.

956. Not the quality?—What I would like to put to you to answer your question was that—I think everyone will understand me—I had bred Shorthorns to such an extent that I had bred my milk away, and I was getting no milk.

957. No quantity?—No quantity.

958. Very good quality probably?—That is no use unless you have quality combined with quantity. To improve that quantity I introduced the Dutch, and I maintain that with the improvement of introducing the Dutch I have had still as big a yield of butter and cheese as I had, in addition to an extra proportion in weight compared with what I was getting in Shorthorns with a small quantity.

959. It has given you a bigger yield of milk?—Yes.

960. And that is the primary use of the Dutch cow, but if you will accept it from me the quality of the milk from the Dutch cows I think it is universally admitted is not as good as that from our ordinary herds in this country. Do you think it would be fair altogether that the consumption of the public should be based upon the quality of the milk produced by Dutch cows, who are notoriously yielders of a big quantity, but of not particularly good quality?—I certainly think so if that quality is that which is produced in England from the cross.

961. If it were equally good?—I guarantee to any man that it is equally good.

962. Are yours Dutch cows?—Half-bred ones—crossed. I am not speaking of the pure-bred, because I have not had experience of them. It is no use my talking of what I do not know something about.

963. You would admit this that if we took a standard to suit these Dutch cows there would be an enormous increase in what you tell us is a common practice for the farmers—that the rich might add the water to bring it down to the fixed standard; if we fixed a standard for your Dutch cows that would have to be a low one to be a fair one for them, and it would give an inducement to the farmers of rich land to add more water to their milk, and to be able to get it just up to the standard and no more—the putting of a low standard would increase the tendency to add water to milk to bring it down, would it not?—I think not. I have not asked you to admit a standard for that low milk yet.

964. I will put a case to you: If you were to fix a low standard it would increase the tendency to watering the milk down to that standard, would it not?—I do not think it would. I do not think that farmers would tamper with their milk in any way. Only I think we want protection. At the present time we do not know where we are. Supposing we will say you got summoned for milk taken into Liverpool, and you went there and saw the authority, they would tell you you have got no standard. I think a farmer wants protecting with a standard of some kind, which we trust you gentlemen will be able to arrive at, through the various evidence you will have before you; that will be dealing fairly with man and man.

965. Do you think it would be fair to take as the standard the milk given by Dutch cows?—I am not in a position to say, and for that reason I am not going to commit myself. I do not know whether a Dutch cow gives good milk. All that I do know is that in Cheshire she gives equally good when crossed as the Shorthorns.

966. All you know is it does work up the quantity in your herd?—I know that if I had had the yield of milk with no loss of quantity I should not have had occasion to cross.

Mr. Thomas Carrick, called; and Examined.

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967. (*Chairman.*) You are a County Alderman and Justice of the Peace in Northumberland?—Yes.

968. For several years you have had experience in keeping a herd of dairy cows?—I have.

969. Have you got that herd still?—No, I do not farm now.

970. For how many years were you keeping them?—For 15 years I kept a herd, but it is about 20 years since I gave it up and let the farm.

971. You have given up farming on your own account then?—Yes.

972. Then you established a creamery for the manufacture of butter and cheese in Cumberland?—Yes.

973. Here I have much sympathy with you, because I have done the same thing in Yorkshire, and I should be glad to hear from you what your experience is. You, first of all, say you have adopted a system of raising cream which is now obsolete; you adopted the Laval separators, and the enterprise, I am glad to see, you report to have been successful—so much so that you formed your enterprise into a limited company in 1883, and you are still carrying on the business as "Carrick's Cumberland Dairy and Pure Milk Supply Company, Limited"?—That is so.

974. Now, you do not produce any milk yourself as a farmer, but you buy from the farmers in the neighbourhood?—Yes.

975. I see you buy your milk and cream from them according to test, and you pay accordingly?—The milk we buy for the creamery we buy according to test, and we pay according to test.

976. Do you buy the cream by weight?—The cream we buy for churning purposes by test as well.

977. Therefore, really, the standard does not affect you so much?—No.

978. If it is low you pay low, and if it is high you pay high?—That is so. We make our own standard.

979. Therefore the evidence you are going to give us as regards the value of a standard does not really come from yourself as affecting your business, but from your knowledge of the dairy business?—Not from that department of the business of which we have been speaking, but from another department where we are distributing between 600 and 700 gallons of milk a day to the public.

980. That is another branch which I have not seen mentioned in your *précis*. What is your experience in that direction?—My own experience is that it would be most desirable if we could have a standard fixed. We find a great variation in the quality—very great, indeed. We take tests ourselves and we find the variation of quality runs from 2·75 to 4·5 in butter fat. That we pay more attention to than the other solids; butter fat is chiefly what we test for. I think it most desirable if we could get some reasonable standard fixed. At present there have been a great many different standards. Some benches of magistrates have adopted one standard, and some another, and it has been a most undesirable state of things.

981. What is your own idea as to what the standard should be?—My own idea personally is that it ought to be 3 per cent. On the other hand, I must admit that there might be cases of hardship where a farmer's milk came up to, say, 2·9; it would be very hard to convict him unless direct evidence could be produced that it was adulterated. If an appeal was made to the herd, and the milk was tested, and it was found to produce only 2·9, I should feel myself that it would be very hard to convict a farmer upon that evidence; but 2·75, I should certainly think, was the very lowest to go.

982. Have you any figures before you to show, on the amount of milk passing through your hands, what are the general results?—I got our manager to get me two or three average samples of milk tested, each month during the last year. The milk is tested every month, and I think it came from a herd of Ayrshire cows. I find from his analyses that the lowest in butter fat is 3·40 and the highest is 4·0.

983. Is that taking all the milk which comes into your creamery or only the milk from one herd?—That is taking one farm. I took another test, which was made in the month of June last year; then the average of the whole of the farms put together was 3·34 in butter fat.

984. Taking the total solids not fat, what were they?—That I cannot tell; we were testing more for butter fat in that case. In some other tests we made—a test was made a few days ago, and I am sorry I have not got the paper here—the result was 3·6 in fat and 8·75 in solids not fat.

985. Was that with milk which came in during last week?—Yes.

986. Then according to the figures you produce a standard of fat fixed at 3 per cent. would not touch any one of your supplies?—I hardly think it would, judging from

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the tests that we have had of that milk which comes into the creamery, where we are manufacturing. We had a case where we took milk in for distribution where it came down in butter fat to 2·75.

987. Where was that?—One farm that was sending, not to our creamery, but to our Newcastle branches, where we distribute the milk, we found on a test there that the butter fat only realised 2·75.

988. Was that farmer supplying your business?—Yes.

989. Did you send him any protest?—Yes, we stopped it at once.

990. That tells me at once what your opinion is as regards the value of tests, and what you think they ought to come to?—Yes.

991. Yet you advocate here that we should put everything down to 2·75—a test you yourself will not accept?—I have known a case where a farmer's milk was tested when it was taken from the cow, and it did not come up to more than 2·75.

992. There are such cases, I have no doubt—numerous cases?—And therefore I would feel it a hardship to convict that man.

993. Supposing you fix the standard at 3 per cent. of butter fat, and at whatever may be fixed upon for the other ingredients, do you think it would be quite possible to work up to that standard if it is not placed too high?—I think that a good managed herd could easily work up to it.

994. In your part of the country at all events?—In any part of the country if they are fairly attended to.

995. Do you get the milk from the ordinary tenant farmers in your county?—Yes.

996. I suppose the radius is three or four miles around you?—We draw it from a large distance—50 or 60 miles from Scotland—for our creamery.

997. Do you get cream?—No, we get the new milk from the Scotch farmers.

998. You are a magistrate; have you sat on the Bench when these cases have been brought up?—I have retired from the Bench when I have been there. There is no standard fixed, and it seemed to me to be a very unsatisfactory proceeding, so I retired.

999. (*Mr. Barham.*) You say that the average of butter fat at your factory—I do not know whether it was throughout the year or on a particular day, or for what period it was—was 3·34?—That was in the month of June that it was 3·34, and in the month of July it was 3·26; that was the worst month we had in the year.

1000. Was that the average of the whole of your senders?—Yes.

1001. You have a large number of senders—50 or 60 perhaps?—I should think about 65 altogether.

1002. And all those senders were paid to produce as much butter fat as they could possibly do?—That is so.

1003. That is to say they had a premium?—Yes, they had a bonus which we give above our standard.

1004. It has been suggested before this Committee that if an additional price was given for rich milk probably it could be produced of a very much better quality; now you are giving a price for rich milk, and the richer the milk the better the price the farmer has for it?—That is so.

1005. And under that system you had an average for one month of 3·34 and for the next month of 3·26?—Yes, that is so.

1006. You think that the only safe limit, or at all events the highest safe limit for butter fat, even when paid on that principle, would be 3 per cent. I mean safe as regards prosecutions?—I fear I should hardly say 3 per cent. if there had to be a prosecution, say, at any point below that unless I could get direct evidence of adulteration.

1007. You would not like even to fix 3 per cent., supposing a prosecution should result from it, unless there was an appeal to the cow?—If I found on appeal to the cow that the cow produced 2·90 per cent. of butter fat, I should not feel justified in a prosecution there.

1008. I have heard a great deal about appealing to the cow. It is rather an expensive and difficult process, do you not think?—I see some difficulties about it.

1009. You have milk from farmers in Scotland, so that in your case you would have to send the inspector or the analyst or the public authority down there, and the case would have to be adjourned, and analysts would have to give opposing evidence before the magistrate would allow it to be referred to the cow, in all probability, so that it would be rather an expensive process, do you not think, to refer it to the cow; at any rate it would not be the simplest thing in the world?—I would not effect it at that stage, I think. Before a summons is issued to the farmer the authorities, having an idea that this milk is not up to the standard, should as quickly as possible send an official there, to take a sample of the herd at the place, and if that did not corroborate what they found to have been taken before, the benefit of the doubt should be given to the farmer.

1010. There is just one difficulty presents itself. Between the first sample being taken and the second sample to confirm it, a month may have elapsed. If the milk was perfect in the month of April, the cows, in all probability, in the month of May would be out to grass, and the whole manufacture of milk would be changed?—That is so. I should not think more than a week at the outside should elapse between the two samples being taken.

1011. The same in the month of October. The cows might be at grass, and the sample of milk taken then by the public authority and a month later the cows would be in the shed?—That would make a difference, certainly.

1013. (*Chairman.*) I forgot to ask you about the cream. You did a good deal in cream, I believe?—Very largely.

1014. Buying cream?—Yes.

1015. And, of course, making cream into butter and cheese?—We make it into butter, and we sell it as cream. We have two departments, one for buying cream for churning purposes, to make it into butter, and another for buying cream and disposing of it as cream in small jars.

1016. What have you to tell us as regards the proper constituents in your opinion of cream? What standard have you adopted yourselves?—We have really no fixed standard for cream, but we have taken several tests. We have what we call single and double cream. A single cream is a cream that is once through the separator, and is used for churning purposes. We find it never comes to 25 per cent. of butter fat. Double cream we find comes to 56·5.

1017. That is your experience?—Yes, that is our experience from a large number of tests.

1018. Do you Pasteurise your cream?—We do.

1019. Have you found it very much thinner?—It makes it thin in the first instance, but after a little standing it thickens again.

1020. Without the addition of gelatin?—I would not allow that at all.

1021. I do not ask you for any of your trade secrets, but the fact remains that if you leave it standing it should thicken?—It does thicken when it cools down if it stands; that is our experience.

1022. (*Mr. Barham.*) You find the addition of gelatin really not necessary; you can get thick cream without it?—I think it is absolutely unnecessary, and ought not to be allowed.

1023. (*Dr. Voelcker.*) You pay for both milk and cream according to the test?—Yes, we do.

1024. I can understand your paying for the cream according to the percentage of fat, because by that you regulate the amount of butter that you produce; but what is your idea in paying for the milk according to that test?—For manufacturing purposes—for making butter.

1025. From the factory standpoint?—Yes.

1026. Not from the standpoint of the distributor of milk to the public?—No.

1027. Not out of regard to the public, if I may put it so?—I should certainly make it my own standard for buying for distributing to the public; but you would not get the public to pay for the increased value of the milk with a high standard.

1028. Do you advocate anything in the nature of grading of milk according to its quality and then getting a commensurate price?—That would be beset with an immense lot of difficulties. I do not think it is practicable.

1029. Then you do not take any steps to repay yourself for your better quality of milk that you send out to the public as compared with the poorer milks?—We advertise to the public that we are sending out a high class milk, and we state that our standard of fat is so much.

1030. What do you give as your standard of fat?—It varies in various times of the year.

1031. It would be very valuable if you could give us those particulars I think?—I have not at this moment the figures with me, but I know we make about three different standards for different times of the year.

1032. You could give us perhaps the highest and the lowest?—The highest is 3·75, and, of course the lowest is 3; we make that the lowest.

1033. You announce to the public the different standards and quality?—We intimate to them that we test all of it.

1034. You intimate to the public the standard of the milk that you are selling?—Yes, I may say we do not do it systematically though; we do it when we are canvassing for trade; then we guarantee the milk with a certain standard of butter fat.

1035. That is, of course, always a matter of business?—Just so.

1036. You get a bit more business in that way?—And we get better customers too.

1037. Are there other people who do that to your knowledge?—I do not know of any.

1038. You score in consequence?—We find it is rather difficult to get the people to appreciate our effort.

1039. You mention that the highest test during 1888 was 4 per cent. of butter fat and the lowest 3·25?—That is so.

1040. Does that apply to milk which you would send out to the public?—No, that applies to the milk that came to the creamery.

1041. Only to the creamery?—Only to the creamery.

1042. Have you not separate tests of the milk that goes out for distribution?—Our manager has tests to see that the quality does not come below a certain standard.

1043. And what is that standard?—Three per cent. of butter fat.

1044. So that when you mention in your *précis* that the lowest is 3·25, that must not be taken by us as guiding us in the quality of the milk distributed to the public?—No, that is for factory purposes.

1045. What would you suggest would be the lowest quality of the milk supplied to you by farmers for distribution?—We should not buy any for distribution if we knew it was below 3 per cent.

1046. Would you think it unfair to say 3·25?—I think 3 would be a very fair standard.

1047. When you say that 3·25 in your opinion would be rather high, and 3 would be fairer, you do that, as I understand, out of the kindness of your heart, not being wishful to do an injury to anybody, rather than from any belief that it represents the normal quality?—3·25 would represent the normal quality that we are getting.

1048. In your *précis* you mention some low tests such as 2·70 of fat; you have nothing to show, I suppose, whether that was genuine milk or not genuine?—I think that was very exceptional. That would not be a large amount.

1049. There are not many samples like that?—I do not think there would be.

1050. When you find that a sample gives 2·75 would you be inclined to tell the man he must not send any more of that kind?—We look into the matter at once and stop it.

1050*. Do you consider it quite possible for him by looking after his cow properly, to give milk that shall at least have 3 per cent.?—Yes, I should think a well-managed mixed herd ought to be safe at 3 per cent.

1051. Would you call it safe at 3¼ per cent.?—No, I should not go above 3.

1052. If you put it at 2·75 as a standard and analysts, Government laboratories, magistrates and everybody agreed to be bound by 2·75, would you admit that that left the way open to a great deal of adulteration?—It would; with 2·75 there would be adulteration.

1053. But you would allow that if it was put at 3 that would knock on the head a good deal of the adulteration that does exist now, and would make the possibility of adulteration rather uncertain?—I think it would.

1054. So that an improvement in the milk distribution to the country would be brought about?—I think it really would.

1055. But simultaneously with that and along with that you would be of opinion that to put it above 3, say 3·2, or 3·25, would be going possibly a little bit beyond what could be reasonably expected?—Yes, it would be going too far, I think.

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1056. I confine my remarks to fat because I take it you have not any experience about total solids?—We have, of course, taken the solids, but we do not attach much importance to them.

1057. You have mentioned that in cases where milk came below 3 it would be a great hardship if there was no appeal to the cow for a farmer to be convicted on 2·9 of fat; do you know of any cases where a farmer would have been let off at 3, and has been convicted at 2·9?—I think there was a case in the County of Durham at Sunderland last year. A very large farmer was summoned, and I think would have been convicted if he had not got the tests made from his mixed herd at the farm, which corroborated the test that the inspector got.

1058. Is it your experience of analysts that, as a gentleman said this morning, they are such unreasonable beings that they split hairs on a difference between 3 and 2·9?—In my experience of analysts they have been most fair and generous towards the public generally, I quite believe.

1059. I am very glad to hear you say so. Do you think if a standard were agreed upon between analysts, Government laboratories and magistrates, that that would tend to more or less division between analysts and the public and analyst and analyst than there is, or would it tend to greater harmony?—If you were to fix a standard.

1060. If there were a fixed standard on which all were agreed, and which had the force of law?—I think it would tend to harmony in the action of the analysts.

1061. With regard to cream, you told his lordship that you regarded the addition of gelatin as both needless and as wrong?—Yes.

1062. Are you sellers of cream?—Yes.

1063. What are your views with regard to the use of boracic acid or boracic preservatives for cream?—Hitherto I have taken rather a strong view upon the point, thinking that it was unnecessary, but I must say my views have altered recently. In certain seasons of the year, and in exceptional weather, there will be a great loss in the value of the cream, and it will be most difficult to do the cream trade without some protection by some preservative.

1064. But that would be exceptional?—Very exceptional.

1065. Would you as a producer of cream think it a hardship to have to state that a preservative had been added?—I would not think so. Rather than have the loss of the cream going sour and bad I would state that a certain percentage of preservative is being added to it, and would let the public know it.

1066. Does the same remark as to preservatives apply to milk?—I do not think milk requires it.

1067. You have one of the biggest businesses anywhere in the North of England, I believe?—I think it is a large dairy business in the North.

1068. I know it is a large one, and you give it as your experience that practically it is not needed?—For our purposes we do not find it necessary, that is to say, we get the milk from the producer quickly, and distribute it to the consumer quickly, and there is not a chance of its going wrong, if it is properly refrigerated before sending out.

1069. Refrigeration is what you employ?—We insist upon all the farmers having proper refrigerators to cool it as it comes from the cow.

1070. In your opinion the fact that farmers know you test the milk keeps them up to the mark?—I think it has been quite evident in our creamery that we have got a higher standard in consequence.

1071. When you have sent out intimations to the public that you give them milk the standard of which practically never falls below 3 per cent. you have not been subject to any inconveniences or ran any risk of prosecutions on account of it?—We have had hundreds of samples taken, and we have never had the slightest risk of prosecutions.

1072. (*Mr. Barham.*) You say that in consequence of your purchasing the milk in the way that you do your milk is no doubt of a higher standard than the general milk supply throughout the country—it must be so?—I think so.

1073. At all events, you pay a higher price for it?—I think we have induced them to feed better, and so they make a better quality milk.

1074. 3·26 is higher than the ordinary dairyman would

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be able to buy?—I think so; I think perhaps 3 per cent. would be what he would get.

1075. Without paying a premium for the extra quality? —In our past experience before we paid by the bonus system we found that 3 per cent. was about the average standard. Since we have paid by this bonus system we have increased that percentage of fat.

1076. In reference to the 3·26, which you gave us as being the average of the supply during the whole of the month of July, of course in order to make the average many of those samples would be below 3·26?—No doubt they would.

1077. This is the average, I take it, of both meals, morning and evening?—It is, but it is the lowest average. It is one of the worst months in the year.

1078. True, but it is the average of the whole month, and includes all the weak samples and all the good samples. Therefore there must be a certain number of weak samples to bring it down to 3·26?—No doubt.

1079. Supposing it included both meals, and one meal was 0·5 per cent. richer in fat than the other, some of this milk would have been under 3 per cent.?—It is possible it might have been.

1080. (*Major Craigie.*) With reference to your remark in answer to a question as to the extent to which you draw the milk that you sell, did I understand you to say that you buy it from as great a distance as 50 or 60 miles?—Yes; I should think from up to 70 miles it is brought to our creamery for manufacturing purposes, but not for distribution to the public.

1081. Is the milk that you buy for distributing collected from a much narrower circle?—It is collected from a radius of 22 or 23 miles—23 miles would be the outside.

1082. Do the producers that supply your milk reside chiefly in Cumberland and Northumberland, or in a southern Scotch county over the border?—The producers who supply the milk for creamery and manufacturing purposes are chiefly over the border, but the producers for the Newcastle district are in the Tyne Valley, within 20 miles of Newcastle and the surrounding district.

1083. May I ask where the bulk of the milk that you supply to ordinary consumers for distribution is distributed?—In Newcastle-upon-Tyne.

1084. Chiefly in that town?—Only in Newcastle. We have nine depots there, that is, nine branches. Newcastle is the only place where we distribute milk.

1085. Do you not distribute at all in the smaller villages?—No.

1086. Only in Newcastle?—Only in the town of Newcastle.

1087. Do you send the milk to Newcastle by rail?—Yes.

1088. Are those tests that you speak of being frequently applied to your milk taken at the Newcastle station on arrival?—They are taken at our chief depôt in Newcastle.

1089. At your distributing dairy?—Yes, before distributing it.

1090. You mention the actual test that you employ in buying your milk; have you used the Babcock test?—Yes, we have.

1091. Have you had any complaints of working by that method?—Our manager thinks the Gerber test much more satisfactory and reliable.

1092. Has there been any difficulty specially brought to your notice as to the grading of the bottles in the Babcock test?—There is a difficulty in ascertaining the correct figure. You have to be most careful, and you must have a good light, as it is so delicately marked. It is difficult to get the exactness that you desire unless it is very carefully done.

1093. Have you had representations to the effect that a little inaccuracy may arise on that point?—We have not had any representation made, only our manager and his assistants have found that difficulty, and have had to exercise the greatest care.

1094. Does that apply to the other test you referred to? —The Gerber test is simpler, and I think it is a better one.

1095. You refer to the selling of milk in Newcastle, and also to the selling of cream, which you supply largely, I believe?—Yes, we do.

1096. I understand that there is a very large demand for the cream sold by itself as cream?—There is a greatly increasing demand.

1097. Is that pretty uniform all through the year?—I think it is increasing all through the year. The consumption of cream has very vastly increased since it has been put up in a form that the public can use it and keep it.

1098. Since you have begun this business of selling cream have you noticed any strong competition with imported cream sold in Newcastle in bottles or cases?—Do you mean foreign cream?

1099. Yes, Swedish cream?—They have attempted it in Newcastle, but I have never come in contact much with it, and it has not been successful so far as I know.

1100. Not as affecting trade?—Not as affecting our trade at least, and I have not heard of its affecting anyone's trade in Newcastle.

1101. There is, of course, in a great town like Newcastle a very considerable quantity of condensed milk?—There is a very large quantity, I believe.

1102. Do you know at all whether that trade has increased rapidly within the last few years?—I could not say; I do not know the extent of it.

1103. Has it not increased to the extent of affecting your own trade in ordinary milk?—I think the quantity of condensed milk that is consumed affects the consumption of ordinary fresh milk very largely, because many families, especially among the poorer classes, use it, and do not trouble to get the other.

1104. Have you had complaints brought to your notice in your capacity of magistrate or otherwise of prosecutions for the sale of condensed milk, which was not what it was represented to be, but was really separated milk?—I have only seen it from reports in the papers.

1105. You have not had any case before you?—No.

1106. You have not heard of any recent prosecutions or action since the passing of the Act of last session in regard to the marking of condensed milk?—No, I have not heard of any.

1107. In your magisterial capacity you have not heard of any?—That is so.

1108. (*Mr. Cowan.*) Would it be possible to fix a standard for cream?—I should fix a standard below which it should not come. My idea is that it should not be allowed to be sold unless it had 20 per cent. of butter fat or over.

1109. There would be a great variation in the cream, of course?—Yes.

1110. But that should be the lowest?—That should be the very lowest.

1111. Twenty per cent. or 25 per cent. would you say? —Twenty per cent. I should make it to be safe.

1112. Have you had much experience of the separated milk?—Yes, a large experience.

1113. What becomes of it?—We give it to the pigs now. We used to make cheese with it at one time, but now we feed pigs with it. It has come to be a very great drawback to the dairy business.

1114. Does it go into consumption at all with consumers?—No, the trade for sale is practically done.

1115. There is no sale for separated milk?—There is scarcely any sold now, it has nearly died out for consumers.

1116. Except to the bakers?—Some bakers use it for baking purposes.

1117. Is it known to you that it is greatly used for making condensed milk?—I am not aware of it myself.

1118. The fixing of a standard would not interfere much with your business in the creamery?—No, it would not.

1119. You buy your milk from the producer according to a certain standard?—Yes, we do.

1120. May I ask what your standard is at the present time that you buy on?—I could not correctly state it at the present time, because we make three different standards during the year, and I am not quite aware at this moment what the standard at the present time is.

1121. It would be a long way above 3 per cent.?—It would be above 3 per cent. at the present time.

1122. 3·40 perhaps?—It is higher now than in the summer, of course. 3·30 perhaps would be the standard now.

1123. You say there is no difficulty whatever in having the standard up to 3 per cent. of fat?—I think if I was a farmer I should find no difficulty in providing milk which should come up to that standard; but on the other hand again I should feel very great diffidence in convicting a

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farmer if he had milk that was proved to be coming from a cow at 2·90.

1124. You would get over that difficulty, would you not, if the city authorities had power to interdict the introduction of milk under a certain standard? Suppose milk was coming under a standard that was fixed for the country then what you would suggest would be that that man should not be summoned and fined, seeing that he might be producing genuine milk, or at least that the milk he was sending to the city was milk absolutely produced from the cow; but you could get over the difficulty if you allowed the city authorities to control the supply of milk, and to say that if milk came under a certain standard they would refuse to accept it in the city; then you would not have the honest man fined?—Refusing to accept, and convicting for fraud, are rather two different things.

1125. (*Mr. Barham.*) Should we not want another Act of Parliament for it; I do not think we could do it under the present Act?—There would be rather a difficulty.

1126. (*Mr. Farmer.*) Does your remark as to preservatives apply to raw cream or to jar cream? Do you use preservatives in each case?—I would not use a preservative if I possibly could avoid it; but in the case of very exceptionally hot weather in order to keep it sweet for two or three days, I believe it is really necessary. Otherwise there might be some great loss.

1127. With ordinary fresh cream?—Yes; but I am certainly against using it if it could be possibly avoided.

1128. (*Dr. Voelcker.*) Do you not have tests at the factory as well as at Newcastle for milk and cream?—We do.

1129. I understood you to say just now that tests were taken in Newcastle for distribution?—That is so, and our manager on finding any milk there under the standard sends a sample up to the factory for the manager there to test it again.

1130. When you receive the milk from your farmers and pay them according to the quality—I understood from a visit of mine to the factory that the milk was tested on the spot, and paid for according to what was found on delivery?—That is at the creamery.

1131. That only applies to the creamery?—Yes.

1132. Are you able to trace the samples?—Yes, quite clearly.

1133. (*Chairman.*) Could you tell us anything about the transit on the railway; does your milk come down from your producers in Scotland in locked cans?—We did start with locked cans to make it more secure against being tampered with, but we found it most difficult to carry it out; the locks were so constantly being lost; now for several years we just have to go with an ordinary can.

1134. Do the railway companies place any obstacle in the way of locking?—They did not at that time, but no doubt they must have a regulation. They must have the cans unlocked so that they can look in. But that was not the difficulty that stopped it; it was the difficulty of getting locks.

1135. You do not use locks now?—No.

1136. Do you seal the cans?—No.

1137. You do not seal them even?—Now we do not.

1138. (*Dr. Voelcker.*) Why should you not seal them?—We did try the seals with a stamp, but we found there was a great difficulty. We had to get them—they were those lead things—from Paris, and we found such great difficulty and trouble in getting them that we gave it up.

1139. But is it a fact that the railway company did put obstacles in the way of churns going closed against inspection?—They never put direct obstacles in our way; but I knew that there was a regulation that they might put obstacles if they were so disposed. They never did so with us.

1140. Have you practically suffered from cases where adulteration has taken place in transit?—We have distinctly.

1141. Are you prepared to say that that may take place?—Very easily.

1142. So that a producer may to your knowledge receive an adulterated article which has left the farmer perfectly true?—That is quite true, I think, unfortunately so.

1143. But if a workable system of locking or closing cans, were adopted it would be a protection to the farmer?—It would be very desirable if it could be done economically.

1144. Separated milk, you say, has no sale now in Newcastle?—It is practically done.

1145. Do you suffer at all from the mixing of separated milk with other milk?—I am afraid we have some people who sell the cheaper milk and hawk it about the towns; in fact I have no hesitation in saying that it is mixed sometimes.

1146. To what would you attribute the going out of separated milk as an article of sale—prejudice?—To the increased supplies of new milk and to the more money that the working classes have to procure it.

1147. Not so much from prejudice regarding separated milk?—No, not so much from that. I think when the people were poorer, and had less money, and had a difficulty in getting new milk they bought the separated milk.

1148. It is just as they like butter when they have the money to pay for it?—Yes.

1149. Do you as vendors of milk suffer from separated milk being sold as whole milk?—I think we do, that is, when separated milk is mixed with whole milk, and reduces the quality.

1150. Do you know of any cases that have come before the courts in which that has been proved?—I am not aware of any.

1151. Do you believe that adulteration takes place on the farms?—I do not think so. I do not know that I can point to a case where there was deliberate adulteration.

1152. But you would say, would you not, that in your case that is not likely to come forward from the very fact that the precautions you take in regard to the milk supplied to you prevent that?—As our producers know that we are testing the milk regularly I do not think we would have any danger of adulteration.

1153. Would you go so far as to say that if the vendors of milk all over the country knew that there was a standard upon which everybody was agreed there would be still less adulteration than there is now? Do not a great number take advantage of the differences between authorities and the chances in all cases?—I rather think that the number of inspectors who are about now taking samples makes the producer most careful to see that there is no adulteration. I think that may have a deterrent effect.

Mr. Alfred Gates, called; and Examined.

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1154. (*Chairman.*) I see you are the manager of the West Surrey Central Dairy Company at their factory at Sherborne, Dorset?—Yes.

1155. How does it happen that the West Surrey Company manage to go to Dorset? I do not quite understand, if you are a West Surrey Company, why you come from Dorset?—We go there to procure what is necessary for our trade.

1156. Have you a factory as well in Surrey?—Yes, we have one at Guildford.

1157. The Sherborne factory then is a branch?—Yes; we have another in Somerset, and another in Ireland.

1158. You manage the Dorsetshire branch?—Yes.

1159. You have been there for twelve years as manager?—Yes.

1160. And you have dealt with nearly five million gallons of milk during that time?—Yes.

1161. I believe you are prepared to put in some records of the testing of butter fat covering 4,031 samples of milk taken from 390,000 gallons during 1899, and tested for butter fat by the Babcock test?—Yes.

1162. I suppose your analyses cover the supplies of milk that are brought to your factory?—Yes, from a radius of about five miles—not over, I should say.

1163. You pay, I suppose, by the results which the tests give?—No, we do not. We give them prices for the year, but they have to guarantee that the milk is pure, and contains all its creams and strippings.

1164. You simply take a guarantee from your suppliers?—We have a guarantee every month. We supply them with a card every month, and they sign their name to this guarantee that the milk shall be pure.

1165. Have you reason to believe from any tests you have made that any of the milk that is supplied to you is

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not pure?—Most decidedly. In the low cases, I believe the majority are, I will not say absolutely adulterated, but they are——

1166. (*Dr. Voelcker.*) Touched up?—Yes.

1167. (*Chairman.*) Do you take the tests for solids not fat?—No.

1168. Only for butter fat?—Yes. I will only say this, that when I find a low percentage of butter fat I take the specific gravity of some sample, and I invariably on the following day take another sample of the same milk, and try it in the same manner; then if the fat is still low, I as a rule complain of it to the farmer, and I almost immediately find that there is an improvement. You will notice that there are very few percentages in the daily range that I have given below 3·25. That lowness of the percentage spread over the large quantity of milk we have is accounted for by the care which the farmers have taken following on the notice I have given them.

1169. I do not quite see how what you say is borne out by your figures. Out of 4,031 samples you had 4,006 over 3 per cent. Therefore, I should have said, you were remarkably free from adulteration?—I am referring to those very low ones.

1170. There are only 25 low ones out of this very large number?—That is so.

1171. Therefore I rather fail to see how you can make a charge against your suppliers?—Only in the low percentages below 3 per cent.

1172. Those are what we are upon?—Those are the only cases which I should say anything against in any way.

1173. I think you are remarkably fortunate if it is the case that you do not pay by results, and simply take what they send?—We have their guarantee, and we test so often, and they know we are perpetually testing; I think that is a safeguard. That is the reason we have very few of the low percentages.

1174. Your figures are very remarkable; is it in a sense a specially good dairy district?—Dorsetshire was noted at one time for its butter. I cannot say much for it at the present time, for I am not able to eat it myself unless it is made elsewhere. The neighbouring county, of course, is more superior as a dairy county.

1175. I suppose you would say from the experience you have got of the milk supplied to you there that a standard of 3 per cent. would not inflict any hardships upon the farmers in that district?—I quite think that, but in these cases of the low percentage I have written to the farmers, and have told them that I should not like to threaten them at all with any proceedings if it went down as low as 2·50; but I think they are able to produce milk at 3 per cent.

1176. Apparently your factory is extraordinarily fortunate; it gets only 105 samples at 3 per cent.; only 25 samples below 3 per cent., and the whole of the rest of the 4,031 are 3·20, or over?—The highest majorities range between 3·40 and 4·40 in the average percentages of the months.

1177. Then I suppose we are free to hear from you tha you do not think there would be any difficulty in putting the standard at 3, or even higher?—I do not think you could from my point of view put it at less than 3 per cent.; I do not think that would be any hardship to any farmers.

1179. You have not had any below 2·80?—We have, nothing below 2·80. They were taken by the Babcock test. Of course, they may have been a little below 2·80, as the test is a little doubtful, but the scale was read with a pair of compasses.

1180. (*Chairman.*) Can you tell us anything about your experience with cream?—I do not know anything much of the composition of cream. I pass a large quantity through my hands from factory to factory. All the cream taken from the milk is sent from my factory to the head factory.

1181. Sent as cream?—Yes.

1182. Do you not make any butter?—Nothing at all.

1183. You simply separate the cream from the milk?—Yes.

1184. And then you send the cream up to the factory?—Yes.

1185. You are a separating station, in fact?—That is it really.

1186. You are not a factory in any way?—Not at all, except that we sell a little there, and send it away to a few manufacturing towns.

1187. Do you manufacture butter?—No.

1188. Do you manufacture a cream cheese?—I make cream cheeses.

1189. Do you test your cream again?—No, we do not. All I have to do is to see that it is of an even consistency, and to see that I get a fair amount from the milk.

1190. Do you pasteurise it before you separate it?—No, we do not.

1191. You turn it out, I suppose, as much as you can of a uniform consistency?—That is what I have to do really—to see with regard to the cream that it is of an even consistency.

1192. You do not, I suppose, bring figures from the West Surrey factories?—No.

1193. Do you happen to have any subsidiary stations in the villages?—No.

1194. Have you ever thought of working that out and starting small separating stations in the different villages?—No, I think not. I think we have found that we have been able to get sufficient in the neighbourhood in which we have located ourselves.

1195. (*Dr. Voelcker.*) These tests are all made by the Babcock method, I understand?—Yes.

1196. That is a mechanical test?—Quite so.

1197. What breed of cows were they that produced this milk?—Mostly Shorthorns, I believe.

1198. Not many Jerseys?—There may be a few, but not many of them.

1199. (*Chairman.*) Could you say how many cows you draw upon; how many cows supply you?—I cannot say exactly. I intended to have got that information, but I had not the time.

1200. How many gallons of milk come into your factory in the year?—I think I can give you the number of gallons as near as possible.

1201. You have said five million gallons in the 12 years; that is perhaps enough?—It is nearly that; it ranges from 4,200 to 390,000 gallons in the last year.

1202. (*Dr. Voelcker.*) I quite agree with his lordship that you have a very fine and exceptional record as regards the quality. Have you any record of the percentage of fat yielded by the different farms; do you compare one farm with another?—In the tables I have sent up, those that are marked with a red tick or a star went through the whole of the year. Each test is numbered in the first column.

1203. You have nothing to tell us about the total solids?—No.

1204. Taking the monthly averages, I see there are absolutely none which fell below 3 per cent.?—That is so.

1205. In other words, you do not recognise any milk that comes below 3 per cent.?—Directly I find it goes below—as in the case of those samples in the daily percentages which run down below 2·80—I write to the individual farmer and complain of it.

1206. As his Lordship has pointed out, the majority of these fall between $3\frac{1}{2}$ and $4\frac{1}{2}$ per cent. of fat?—That is so.

1207. Taking the daily samples in the whole course of the year, out of 4,031 there are only 25 which gave as low as 2·8 of fat?—Those are the only ones to be found.

1208. So you would consider that the setting of a standard at 3 per cent., or even a little above 3 per cent., would not cause any hardship?—I think myself that the mixed herd milk really would almost work out at 3·20 per cent., although I should not like to fix the standard at that.

1209. Are any of your farms from which these are drawn in the county of Somerset?—I think none of them are; I think they are all in Dorset.

1210. I notice that some of these are very high percentages of fat; are the farmers who supply this milk acquainted with the high percentages or not?—Those very high ones, do you mean?

1211. I do not mean the very high ones. I will take them from 4 to $4\frac{1}{2}$ per cent. of fat?—I should be very pleased at any time to give them the information if they asked for it.

1212. But not being paid according to it, they do

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not know of it?—No. We give them a price that satisfies them.

1213. But you have your suspicions that when you get them coming below 3 per cent., or even as low as 3 per cent., in some cases they have been watered down?—Not always watered down.

1214. Or the cream removed?—Yes, or careless working.

1215. You have your own suspicions that when they go as low as 3 something or other has happened that quite justifies you in touching them up on it?—Quite so.

1216. Does this milk go straight from you into distribution?—No, it is separated for cream purposes.

1217. So that you do not take any steps to equalise the milk like an ordinary milk vendor of whole milk?—No, but we sell a little new milk as accommodation milk, which, as a rule, I take the precaution of getting from the good dairies.

1218. I was going to ask whether if you found this milk as high as 6 per cent. you would, as a previous witness said, think it at all a right thing to bring it down to 3 for the sake of the public?—Most decidedly not.

1219. But that does not affect you inasmuch as you are not senders away?—We do not send more than 100 gallons of milk a day.

1220. It is not a material thing for you?—No.

1221. From your Guildford Depot do you not send out milk?—Not much of the new milk, I believe.

1222. Do you send out cream?—We send out cream, butter, and fancy cheese.

1223. So that the question of transit and locked churns does not affect you much?—We sell a great deal of separated milk upon the line.

1224. Does any of that come back to you?—From the farmers do you mean?

1225. Yes?—No. We send a great deal to the farmers for pig feeding.

1226. Will they buy it?—We have the option of sending it back to them, and we pay them a good price with that option of returning or retaining the separated milk if we require it.

1227. Is this separated milk sent far on the line; is it sent by rail at all?—We send it by rail. We have contracts for biscuit making and various other purposes.

1228. Who are the people who buy it; are they bakers, or does it go into general consumption as separated milk?—The bakers buy a great deal, and it goes into consumption as separated milk in some cases—in London especially I believe.

1229. In London and in the country districts?—Not in the country districts so much I think. We send down to some of the south coast towns for that purpose.

1230. With regard to the cream, do you use gelatin at all?—Most decidedly not; we use nothing whatever.

1231. Would you consider the use of that to be wrong?—There is no necessity for it in our case. We work the cream into as thick a cream as we can procure.

1232. You send out only thick cream, I believe?—We have thin cream, which is used for tea purposes.

1233. Have you yourselves any standard of fat, or is it only a difference of mechanical appearance that guides you with regard to the thick and thin cream?—We have no absolute standard as regards the fat in the cream.

1234. But you do use preservatives?—Yes.

1235. Do you notify that in any way?—We are doing so now.

1236. Do you think that will cause any objection?—No, not at all.

1237. You do not think it will injure you?—Not at all; in fact I say we are bound to use preservatives.

1238. You find in the case of cream that at certain times you cannot keep the cream naturally for a length of time?—Our trade is so large and so widely distributed that it would be impossible to sell the cream unless it were preserved. We send it to the South of France.

1239. You do not think that the notification of the fact that it is preserved will do you any harm?—Not in any way.

1240. Have you anything to do with condensed milk?—No.

1241. (*Mr. Barham.*) Do you think it is desirable to fix a standard for cream?—I think it is almost impossible; the variations in the butter fat are so enormous.

1242. Do you think it would not be possible, and also extremely inconvenient—at least if it were not possible we need not go into the convenience?—I do not know that it would inconvenience us in any way; the being possible is the point.

1243. It would be a great deal of trouble to sample it falling from the separators, and that sort of thing, and then passing through the second time, and the volume that is taken away from it?—Quite so.

1244. I suppose these farmers you have really had under your supervision, and they have been under your training for a number of years?—For the last 12 years that I have been in the neighbourhood.

1245. So that you have really worked them up to this point?—I fancy that must be the reason. They know that I am perpetually testing, and that I am fairly cute upon the matter.

1246. I know the district you come from in Dorsetshire. Is it not the fact there are a great many cross-bred Guernsey cows there; the orange or deep yellow, and white cows?—I do not think so.

1247. Between Weymouth and Southampton, in that part of the country there are a great many?—We are in the north part of Dorset—at the very north, on the very edge of Somerset.

1248. Have these tests been made from the milks each time, or are they made on the average of the two meals?—Each one has been got separately, and you will notice on the record I have put in, the number of meals is given in every case both morning and night. At our Irish factory we pay by results, but in England, being on the main line, we find it is almost an impossibility to do so. Might I say one word about the locking of milk cans with regard to which you were questioning a witness just now?

1249. (*Dr. Voelcker.*) But you have no experience of that?—I have this: I told you that I sold a little milk on the main line. In one case I do lock a churn, as I have found it necessary. It went to London, and then went from London off on to another line. We found there that it was habitually being tampered with, and therefore that we were bound to lock the churn. I can give you an instance where even separated milk has been pilfered upon the railway. One customer complained that there were tea leaves in it. No tea was made on the premises before it could get away, so how could the tea leaves have got there? It happened to go to a town where there was a sanitary inspector, who took the samples for the bacteria in the milk. I maintain that these tea leaves being in the milk showed that somebody had taken his dirty can and dipped it into the milk; the can had gone down too far, and the tea leaves had floated out into the milk; and not only was the milk contaminated by the tea leaves, but no doubt there were a great many bacteria put into the milk off his dirty can. That can may have been stood on a bit of horse dung on the platform of the train.

1250. (*Chairman.*) The single churn that you talk of, is that filled up to the top?—No, it is not.

1251. Is there any difficulty with the railway company in determining the amount of stuff inside it?—Of course they take that from us. We are very large customers of theirs on the railway. We paid them, I think, over £1,500 last year for carriage direct from the one station, without the carriage backwards.

1252. You have no difficulty with the railway in the matter?—No, I think not. In this case I was speaking about where the tea leaves were found, the milk went on the London and South Western and the London and Chatham, and they did make a complaint that the churns were not locked when I wrote to complain at one time.

1253. (*Dr. Voelcker.*) Does the same apply to your Guildford factory?—That I cannot say.

1254. Have you any difficulty with the railway there; do they allow churns to be locked, or not?—I could not tell you that.

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Mr. Sidney Job Pocock, called and Examined.

1255. (*Chairman.*) You are a member of the firm of Freeth and Pocock, wholesale milk contractors, London?—That is right.

1256. You have come here to tell us what is your feeling in the matter of fixing a standard; perhaps you would like to say in your own way what you feel upon this matter?—The question of fixing a standard for milk, I think, is a most difficult one, considering the circumstances and the surroundings that milk is subjected to. A standard would have to be fixed, of course, not for one county alone, like the good county of Dorset, or like the Aylesbury district, where a large quantity of cream is produced from the milk but a standard, I take it, would be fixed to cover all counties, poor and rich. I think myself, after carefully considering the matter—and I have had about 25 years in the milk trade, and before that I was a producer of milk in Berkshire—that it is almost as reasonable to fix a standard for the cow's offspring as for the milk she gives. If we take as a standard a low standard, it would most certainly be unfair to the consumer, the public, for this reason—I believe that the better quality of milk which we might put down as high-class milk probably covering as much as 75 per cent. of the milk that comes into London and other towns, would give an opportunity for those dealing in milk, and even for the farmers themselves, to tone that high-quality milk down to the standard. I believe that after a standard was fixed there would be worse quality milk supplied to the public than is supplied at the present time. There is a standard now, of course, we know. There is the Somerset House standard, which is a standard fixed for analysts, but it is not an advertised standard that is known in the trade and amongst farmers. We have this in our minds at the present moment—both producers and distributors—that if we adulterate milk with water, or if we add separated milk to the new milk, or if we take cream from the milk we are liable to a criminal prosecution. This is in our minds hard and fast. But I take it if an advertised standard were fixed this would be forgotten. We should not work to that the same as we do at the present time. It would naturally occur to us that we have the standard in our mind and we have this standard to work to. So that I feel sure if a hard-and-fast standard is fixed there will be a lower quality of milk sold in the future than there has been in the past. If we take an average standard—what I mean by an average standard is this: to take a number of samples and strike the average between the lowest or worst quality and the highest or best quality—if a standard of that kind were fixed, well, it would be all right if we were prosecuted upon averages, but we are not prosecuted upon averages. We are prosecuted on a particular sample that might be taken quite at a disadvantage, when the cows possibly were giving just their poorest milk. Therefore, it would be quite unfair to the distributors and also to the producers to fix even an average standard. I would like to point out that the prosecution is a criminal one, which is a very serious thing in my mind, particularly when we are not guilty. If you fix a high standard you cause an enormous amount of trouble and friction between the producer and distributor. We should be everlastingly working and worrying and plaguing our farmers to keep up to this high standard. So that we have to look at the matter as regards the standard from many standpoints. Of course, milk is a natural product, and to my mind I think it ought not to be classed with manufactured articles. We cannot tell what the cow gives until she has given it. Take a dairy show, for instance: we have it on record that cows there, which have been bred for producing good-quality milk, have produced in the presence of witnesses at the show, and analysed by the society's own analyst, milk containing as low as 1.89 of butter fat—I am speaking of the last Dairy Show. There was another cow which gave 2.57, another cow which gave 2·47, another which gave 2·43, and another which gave 1·88. These were cows specially fed and bred to produce good quality milk. They were brought to the show for that purpose, that is to take prizes for quantity and quality of milk—if that be so, what about the ordinary farmer feeding his cows in an ordinary way? Then again, milk varies enormously according to circumstances. Take a drought, for instance. Anyone outside the trade would be astonished to find the difference there is in the quality of milk during the dry season. I suppose it is very largely owing to the cows being so thirsty and drinking such a quantity of water—it may be that, but I am not sure. We may have a drought in the West of England, and we may have an ordinary season practically in the North. We find that where there is the ordinary season, the right weather, where the cows are fed in that climate, the milk is coming all right and does not vary. Take last August. You will remember that we have had droughts these last two years. Last August we were just beginning to feel the drought in the testing of the milk. We ourselves took something like 17,000 samples and had them tested last year out of the number of farmers we have sending to us, which is about 300, the milk coming from about 9,000 cows. We found that the milk in August was coming low; it was gradually getting down in quality, particularly in non-fatty solids. One farmer particularly, in Dorsetshire, who farms his own farm, and milks about 60 cows, had his milk drop down in quality considerably. We sent one of our inspectors to the farm to see the cows milked and the milk refrigerated, and to take samples. He did so, he watched the cows milked and the milk refrigerated; he superintended the cooling of the milk himself, and took samples from each churn in the presence of the farmer and his wife. Now, these samples on analysis varied considerably; the fat in one case was 2·90, and the non-fatty solids 8·52. That was a poor sample. Another sample was as low as 7·44 in non-fatty solids, and the analyst certified it was adulterated to the extent of 13 per cent. of water. The other sample was down as low as 7·29, and the analyst certified that it was adulterated to the extent of 7 per cent. of water. Those samples were in the hands of the inspector from the time he took the samples at the farm and sealed them until they were handed to the analyst. Samples were also taken at Vauxhall to check in order to see if the analyst was right, and I must say we do not often find them wrong, but we were very anxious in this case. They corresponded to a T, and yet we know that that milk was as from the cow.

1257. Were those samples taken from individual cows?—No, they were taken from the same herd. Many make this mistake, which I should like to point out here. There may be a herd of a thousand cows, but in taking samples there may be only six or seven cows' milk in the churn from which the sample is taken. So that you can quite understand the variation in these samples, and you can quite understand that the same herd would give very different qualities of milk in the different churns. There may be a lot of old cows which would give rather poor milk, or certainly much poorer milk than a shed of heifers; but it is impossible for a farmer with a large herd of cows, although it would be well if he could do so, to mix the whole herd's milk together, and then place it into the various churns before it is sent to town. But even then there might be an evil, because the milk would be put into a large vessel, and if it stood there for a few minutes the cream would rise to the top, so that the first churn possibly would get a better quality milk than the last; there would, therefore, be an evil in that way. Now this particular farmer's milk that I am speaking of, I had samples taken of a short time before, in our usual way of testing. His milk then showed as high as 3·5 of fat and 8·6 of non-fatty solids. Another sample showed 3·3 of fat and 8·89 of non-fatty solids, and a third sample 3·4 of fat and 8·89 of non-fatty solids. So that you can see very well, I think, that this is as genuine a case as anyone can bring before the Committee, and proves that the milk varies in quality very much owing to circumstances, and in this case the particular circumstance was a drought. Now, a wet season will marvellously affect the quality of the milk. I remember during 1879, when we had that terribly wet season, and also during the winter following 1879, we needed no analyst to tell us the quality of the milk. When we saw the milk it was quite enough for us; we could see that it was of a wretchedly poor quality; but no one could help it. It was unfortunately owing to the circumstance of the wet season. The poor quality, no doubt, was owing very largely to the washed-out hay that the cows had to eat during the winter. Then, of course, different pastures will give a different quality milk. We had two fields in Berkshire, one field was a feeding ground, not a mowing ground. During the time that the cows were in that field the milk was of excellent quality and everything that one could desire; we made a good quantity of butter and a good quantity of cheese out of it. But within 24 hours of the cows going into

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the very next field, which was a mowing field, down went the quality at once to a very low ebb indeed. I have not the reports of this. It was so long ago that I cannot verify it, but I know from experience that that was the case. Then again the change of atmosphere will affect the quality of the milk very much. If you have a shed of cows where the shed is closed and warm, the quality of that milk will be much better than if the cows are kept in an open skilling, as we call it in Wiltshire, where the cows are exposed to the wind and weather. If the weather is cold and wet, and there is a north-east wind, those cows will not give such a good quality of milk as the cows will which are in the warm shed. I suppose the fatty parts of the milk go to keep up the heat of the body—that I am not quite sure about; but I know it is a fact that the milk suffers. Then, of course, the different breeds of cattle affect it. A standard, I take it, would have to cover pretty well everything. Everybody who knows anything about milk at all knows that the different breeds of cattle vary enormously. Then there are the different periods of lactation. When a cow is giving her largest quantity she is giving her poorest quality; we cannot expect the cow to give quantity and quality at the same time, and, of course, as she decreases in quantity up to a certain point she increases in quality. Of course, the standard would have to cover such times as that. Then again, there are the different times of milking. The evening's milking is much richer than the morning's milking. Here again I think that our samples in London are not taken in a fair way. The public get much better milk than they are led to believe from the number of cases that come before the Court. Very often the milk that the inspectors take is the poorest milk, but the public, of course, get the evening's milk, which is the richer milking, delivered to them the same as they do the morning milking, so that the public are better served than I think they are led to believe. Different stages of the same milking lead to different results. We know perfectly well that the first drawing from the cow is much poorer than the strippings, and if the milkers are not very careful and strip out the cow as well, there will be a lot of poor milk in consequence. Of course, that you may say is carelessness which should be avoided, but it is a very difficult thing in these days to get milkers and to keep them up to the mark. I consider that it would be very good if we could fix a standard that is workable. There are many advantages in favour of it, but I think the disadvantages would be very great; I mean this, it would be such a difficult thing to fix a standard to do justice to all concerned, and for all times and for all seasons. As regards cream, I do not think there is any necessity for a cream standard at all. People, of course, have thick cream, or they have thin cream, and they pay a price accordingly; therefore I do not see that there is any necessity for a standard for cream in any way. I think that is all I have to say, except I would like to mention that if a standard is fixed it would affect the wholesale trade (and I represent the wholesale trade in London) considerably. It would cause a very great deal of friction between the buyer and the producer. We should, immediately the standard were fixed by the public authorities, have to go one beyond that in order to be safe, and it would be a great difficulty to work the farmers up to that pitch. Of course, I could easily pick out of my 300 senders the plums, as one might say, that is the best of them, and there would be no difficulty in getting the standard, whatever the authorities might fix, as long as it was a reasonable standard, from them. But then we have to consider the lower grade milk as well as the higher grade milk. Again, if a standard were fixed I take it that we should be still more liable to a criminal prosecution. The lines, I take it, would be very fine indeed; that is if a standard is fixed, that standard, I presume, would have to be worked to by the analyst, and also by the magistrates. We know that the Act provides that the analyst's report only raises a presumption that the milk is wrong till the contrary is proved, but it is a difficult thing to prove the contrary. If you will allow me just to state one case I will tell you what would most naturally occur. An inspector takes a sample of me, we will say, to-day; I send my third sample which is handed to me to my own analyst. He certifies, assuming the standard were fixed at 3, that the sample was a little over 3, say a few points over 3. When I get the report I thank God that I am safe and all right, and it is off my mind, and I think there will be no prosecution, and I dismiss the matter from my mind entirely. But probably in three weeks or a month's time I get a summons on account of the sample which the inspector has sent to the analyst not being up to the standard that the public authorities demand. Three weeks after I should have to bring evidence from here and there to prove that the milk was sold to the inspector as from the cow, and it would be a very difficult, and I say it would be a very costly thing for me so to do, and I think a very unfair and a very unjust thing.

1258. I take it in regard to this last statement that you make, if the summons was returned three weeks after the analysis has taken place, or even if it is only three days after, you in your position as wholesale dealers would never be able to trace that to the particular cow?—No, not to the particular cow.

1259. You say you deal with the milk from 9,000 cows, therefore you have such an enormous amount of stuff that you could not tell what particular churn it came from?—We ourselves have not 9,000 cows, but our farmers that send to us have.

1260. You receive supplies from 9,000 cows?—Yes.

1261. And you would never be able to trace the particular milk in question to the particular supplies, would you?—We could trace the milk from the particular farm, but then we should have to bring forward all those through whose hands the milk passed, and they are not a few. There would, of course, be the man who milked the cow, the one who cooled the milk, the one who drew it to the station; then there would be the porters at the country station; then there would be the others at this end, the London end, and those who fetched the milk from the station; the foreman who measured it out, and the man who handed the samples to the inspector. It would be a very difficult and a very costly, and I say, a very risky thing to do to be certainly and positively on the right side.

1262. I suppose as matters stand now you are liable at any moment to have a visit from the inspector?—Yes.

1263. Your milk is subjected to analysis by somebody?—Yes.

1264. You run the risk now of being shot at?—Yes, we do run the risk.

1265. For purveying at all events adulterated milk you run that chance now?—We do.

1266. You do not know where you are, and you do not know what view the inspector or the magistrate may take?—No, we do not.

1267. You are in a very unsettled state as it is?—Yes.

1268. And yet you say you would rather not have a standard fixed?—I would rather not have a standard fixed. We do know what has happened in the past. We know how we stand now, and there is, I take it, not the nicety at the present moment that there would be if a hard-and-fast standard were fixed. I take it that the magistrate and the analyst would have to go by that standard, whereas as it is now I think that most analysts —I know one of our analysts does—take a great many circumstances into consideration. In fact, during the last drought one of our analysts, who is a very eminent public analyst, took it into consideration, and I know he gave his reports to the vestry in accordance with that, that is, he found by analysing a number of samples that the quality of the milk was getting low. But if a standard is fixed that consideration will have no weight, and will be thrown overboard entirely. Then, again, my lord, I should like to mention that if you start a round with the milk up to the standard—and I presume that the Government or the authorities would not demand any more—by the time that round was finished the milk would be below the standard. That is owing to the constant dipping—one man possibly would supply 150 or 200 customers—I am speaking now more of the retail than of the wholesale trade.

1269. We had it in evidence that a man with a can going round when he got back to his home, if he had anything left in his can, it would be still richer than anything he had given out during the middle of the day?—I will tell you how that it. That would be from the can that contained the milk being a large one. As the van was going round, in that particular can the cream would be gradually rising, particularly when the horse was standing still, and as the milk was drawn off first of all, the cream would gradually come after. But that is only one branch of the trade. There are many people who have not a van, and they cannot afford it. They have their pails, and they have what they call the hand cans, and they are constantly dipping from the top. There are two principles in supplying milk. What you have

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said would happen in one case, and in the other it would be the reverse.

1270. (*Mr. Barham.*) One is drawn from the bottom; the other is taken from the top?—That is quite right.

1271. (*Chairman.*) Of course I am not in the mysteries of the trade as much as you are. I am only speaking of the ordinary milk can that I see in the streets, and that has got a tap at the bottom?—Yes; that is in the case of those who are in a large way of business, but everybody cannot afford that. Everybody has not a large capital at his command to have these things that some companies and large dealers have. But I take it that a standard would have to cover everything, and it will only be fair if the standard is fixed to cover everything, not one alone but the poor as well as the rich.

1272. (*Mr. Farmer.*) You said that you would have to go one better with the farmer?—Yes.

1273. Do you stipulate for any standard now with the farmer?—No, I do not. I will show you the clause in our contract on which we buy. Our contract states "All milk to be sent perfectly pure and wholesome, with all its cream as from the cows, and each and every consignment of milk to have a label attached, signed by the seller or his representative, and bearing the words 'warranted pure unskimmed." Another clause (12) states this:—"That no food shall be given to the cattle that shall deteriorate the flavour or quality of the milk, and make it unsaleable." We should have to burn these contracts if a standard is fixed, and we should have to introduce into this contract a standard, and that standard would be above whatever the authorities fixed, and it would give us a great deal of trouble, I believe. (*See Appendix* No. V.)

1274. Have you a clause there with reference to an analyst; I have never seen your contract, but generally there is such a clause in contracts saying "We shall accept the verdict of an analyst"?—That is not in our contracts. I have brought with me a bundle of our analyst's reports from our file. I asked our inspector who took them from the file to give me about a dozen of good quality milk—high-class milk—and also about a dozen of lower grade milk, and these are samples that he gave me, which you can see if you like. I find that some of them are down to 2·9 per cent. of fat. I would like to mention also that in our experience the quality corresponds almost to a nicety with the report made by Professor Bell in 1883. If you take one page of his analysis (page 22 of his book) it will give you a fair idea of the quality of milk that we are receiving, and have been receiving. Some of these go down to 2·31 of fat, and some of them are as low as 2·19; others go up to 4·0 and 3·5. They vary considerably, in fact, and so it always will be; as long as the cow gives milk she will give it in various qualities.

1275. Do you happen to know what standard is fixed by any of the dairy companies now?—No, I do not. I know of the Somerset House standard of 3 per cent.

1276. Have you heard of 3·5?—I have heard that the Somerset House standard has been fixed at 3 per cent., and I have known very great injustice done.

1277. The Somerset House people will tell you that they have fixed no standard?—Of course, we only have to go by what we have heard.

1278. If Professor Thorpe were here he would tell you that?—He is the authority, of course. I have known this: I have known people in the trade who have been summoned for milk just below 3 per cent.; 2·9, I believe, were the exact figures. I have known that a person was summoned, and fined 50s., besides costs, not so long ago in the district of Battersea, and I am sure that that milk was pure and as from the cow.

1279. (*Chairman.*) I suppose the analyst reported in that case that in his opinion there was some reason to show that the milk was adulterated?—I do not know what the analyst stated in the report.

1280. (*Mr. Farmer.*) Your agreement is the most liberal agreement I have ever seen?—We only claim for what we know is practical, but we do our best to keep every farmer to that point.

1281. I do not know whether you know that the late Metropolitan and Suburban always stipulated for 3·5 in their contracts. Welford's, and the Belgrave, and the Aylesbury Dairy Company too, now stipulate for 3·25?—I know this, if they buy milk from the dairies they may stick it in their contract, but they do not get it in their churns—I am quite sure of that. I like to be consistent in the business. We have milk pure, un-skimmed, and as from the cow.

1282. (*Chairman.*) Apparently you object to any standard at all, either the so-called Somerset House standard, which is really no standard, or a new one, which may, or may not, be fixed by the Board of Agriculture; the only standard you want is purity as from a healthy, well-fed cow?—That is so.

1283. If that is the standard on which all milk-sellers were to be judged I take it the objections you speak of would arise in your case too, because you would have to go down to see that the milk produced from the particular cow to begin with came from a healthy and well-fed cow, and was absolutely delivered as from the cow; I do not know how you are going to prove all that?—That standard, I take it, is practically what it is at the present time. We know there is the Government standard, as we call it in the trade, and we must have a standard to work to, otherwise the milk cannot be analysed.

1284. I understand you want to get rid of all this?—No, I do not. What I do not want is this—I do not want an advertised standard, which we should have if the public authorities fixed a standard. I feel positively sure that the public would get worse milk if we all had to work to the advertised standard. As I said just now, it is fixed in our minds in the trade that if we adulterate milk or add separated milk to the new milk, or take some cream from the milk, we are subjected to a criminal prosecution. That is in our minds, in the trade's mind; we know there is a standard because the milk cannot be analysed without a standard—but that does not come into the trade—it is between the analysts.

1285. There should be some sort of analysis somewhere in the case of these enquiries?—Yes.

1286. Yet I cannot ascertain from you what you think should be the standard of analysis?—If I may give you an opinion as to the standard, assuming that the Committee had decided to fix a standard to do justice to all concerned in the milk trade and to cover all circumstances, seasons, droughts, and so on, I do not think there would be justice done if a standard above 2·75 of fat and 8·5 of non-fatty solids were fixed.

1287. Now we are getting to closer quarters?—But even then I should be sorry to have the standard advertised right and left. We can see by the many tests that we have taken, in the Dairy Show particularly, where they are taken in the presence of witnesses, how the cows fall below the mark considerably. I am quite sure that there are some herds of cows, even to-day, which are sending up milk that will not produce more than 2·75 of butter fat and 8·5 of non-fatty solids. Of course, we get milk below that, and if we do we deal with it. Only yesterday I stopped a very large farmer; the moment I had the report back I declined taking any more milk from him. But I must confess that I should not have done that if that milk had come out 2·75 of butter fat and 8·5 of non-fatty solids; we should have gone into the matter, and asked him to change the food, we should have tried to have got a better quality of milk. To do justice to all concerned I say 2·75 of fat and 8·5 of non-fatty solids.

1288. Do you think that if that was absolutely fixed by law as a statutory limit no hardship would be inflicted either upon you, the seller, or upon the producer?—I think not. There ought to be milk of that quality. I think cases then would be very few indeed which would come below that when injustice would be done.

1289. You do not think it is likely that the people who are manipulating the milk, if they had a richer milk, as they would have undoubtedly in a great many cases (because there would be a vast lot of much richer milk produced in the country) would bring it down to this standard?—I do not see why they should. I do not think they would.

1290. That is only a matter of opinion?—It may be so. If a hard-and-fast standard were fixed at that it may induce some in the trade to work to that standard. I know of a very large dairyman in the West of London. I was talking to him about the fixing of a standard, and I put this question to him: I said, assuming that a standard is fixed by the authorities, would you work to that standard, or would you send out your milk pure unskimmed and as from the cow? He said, I should work to the standard, of course. That would mean that he would bring his high-class milk and high quality milk down to that standard. That is only one instance in point, but I know of others as well, and I am more convinced than ever that if a standard is fixed there will not be such good quality milk sold in the future as there has been in the past.

1291. (*Mr. Farmer.*) Of course, if you brought that down to the standard you could not regard it as genuine milk, could you?—No, but who is to decide?

1292. He would be open to a prosecution for adulteration if it could be found out?—I think not. How would you find it out? A man gets under a bushel or behind the door to adulterate his milk, he does not do it in the open.

1293. I mean if it could be found out?—How could it be, if it is up to the standard there would be no prosecution, simply because the milk was sold as the authorities demanded.

1294. (*Dr. Voelcker.*) You prefer, in other words, a bogey standard to a real one?—If you like to put it that way.

1295. Yes, I do?—I would rather have a standard that is kept between the analysts, where the analysts can take everything into consideration, I mean the times of the year, the droughts, and so on, than I should have a standard that should be fixed and which would stand good through all circumstances.

1296. But you would agree that it would be better that the authorities, magistrates, analytical chemists, and others should be agreed about that standard rather than that there should be differences of opinion between them?—Yes, I do. I think that analysts should have one method and one method only in analysing milk, and not have various methods; I think then they would arrive at correct results better.

1297. Now, what are the tests that you make yourself for checking the milk sent under that contract, the terms of which you have given us?—We have so many churns to test.

1298. Have you your own analyst?—We have not our own analyst; we employ three analysts, and we send samples to each one.

1299. Do you know yourself upon what they base their statements as to adulteration or otherwise?—No, I do not.

1300. You simply go by their statement?—We go by their statement.

1301. Then their statement may be at variance with that of another analyst?—Yes, it may be so.

1302. And action taken upon that may result in a difference of opinion, and consequent trouble to everybody all round?—They may differ in their opinion.

1303. So matters would be simplified by the unanimity of analysts and authorities?—As regards the analysts, I think it would be much simpler for them, but I still think there would be a great deal of injustice done in the trade.

1304. You say you do not approve of a standard, but still you must have something for telling whether a milk is pure or not within the terms of your contract?—Exactly.

1305. For that you rely upon the reports given you by your analyst?—Yes, we do.

1306. Why would you run a greater risk if a standard was agreed upon by those different people than now when you have a standard which is not agreed upon?—The risk, I take it, would be this: there would be a greater nicety; there would be the standard for everybody concerned, analysts and magistrates, to work to, and if the report placed before the magistrate said that the milk came a shade below that standard, he would have no alternative but to convict; he might say: If you bring the cow and milk the cow in front of me, and if that cow does not give the milk up to the standard that the authorities have fixed, I must convict.

1307. (*Mr. Farmer.*) "Until the contrary is proved" the Act runs?—Yes.

1308. (*Dr. Voelcker.*) What do you mean by saying a standard for analysts to work to?—They do have a standard, and must have a standard to work to.

1309. You have told us that your analysts take into consideration different seasons of the year, and so forth?—I know one does.

1310. Is it your experience of analysts that they are all so unreasonable that they do not take these things into consideration, and that they go merely upon a figure?—I think they would go upon a figure if a standard were fixed.

1311. You have told us that there is a supposed standard?—Yes.

1312. No doubt public analysts know that as well as everybody else; do you suppose they would go any more strictly upon a different standard than they do upon the one that is now in existence?—Possibly not, but there would be a niceness about it if the authorities fixed the standard. I think, as I have said before, that if the analyst's certificate came before the magistrate, stating that the milk was below the standard, the magistrate must convict, whether the milk is honest or not, whether it is as it comes from the cow or not.

1313. You have told us that you sometimes get milk that is of such a quality that you stop the farmers sending it any more?—That is so.

1314. What is the point at which you do that?—That would be below 2·7 of fat, but in this case I have mentioned to you——

1315. That is rather a nicety, is it not? Do you stop dead at that?—No, you did not allow me to finish it—it was not owing to the cream that he was stopped. It was owing to the non-fatty solids being low; they were down I think, to 8, if I remember right.

1316. His watering of the milk was stopped?—Yes, it means that the milk was watered.

1317. Then you have a point at which you stop, too?—Yes, we have.

1318. And when the milk comes to that you tell the farmer that he has got to send it better; do you find an improvement?—If he does not send us the milk we do not see any improvement.

1319. You have told him that he should not go on supplying if he did not send better?—I did not give him an opportunity, I stopped him straight.

1320. I certainly have it on my notes that you told him he would have to get it better?—I am sorry if I misled you.

1321. (*Mr. Barham.*) Have you power under your contracts to stop at a moment's notice like that?—Yes, we have; I could read the clause if you like.

1322. (*Dr. Voelcker.*) Would you tell me what, in your view, would be the difference between an admittedly low standard such as is believed now to exist, and the raising of that, say, to 3 per cent. of fat?—The difference between what low standard?

1323. Between the 2·75 and the 3 per cent. of fat?—Three I fix it at.

1324. What would be the difference as regards the farmer or the vendor; would any hardship be done?—I think there would be hardship done to the farmer on many occasions if a standard were fixed higher than 2·75 of fat.

1325. You have mentioned the case of Dorsetshire cows. We have just had it in evidence that certainly a large number of cows in Dorsetshire produce some very good milk, far above 3 per cent. of fat?—Yes. This particular farm that I am speaking of now is on what are called uplands, and also water meadows.

1326. Not suitable high class dairy land?—I beg your pardon; it is very suitable indeed. I have three reports here, where the farmer sent excellent milk. I see they are 3·5 of fat and 8·6 of non-fatty solids; 3·3 of fat and 8·89 of non-fatty solids; and 3·4 of fat and 8'89 of non-fatty solids.

1327. (*Chairman.*) Is that the same farm?—The same farm and the same cows entirely, and not an old cow amongst them. The cows were milked, and the samples taken in the presence of witnesses.

1328. (*Dr. Voelcker.*) Then you could not account for this one cow giving a bad quality?—It was the whole herd. The different samples varied. I take it that possibly some were heifers, and some were cows. As I said just now, we may take a large herd, but after all there are only about six cows' milk in the churn from which the sample is taken.

1329. (*Chairman.*) That is a very imperfect way of getting at the milk of a herd surely?—It is, but it is very usual.

1330. It might lead to misleading results?—If you have 100 cows in full milk you would have to have a very large vessel indeed to put the whole of that milk into in order to take the sample.

1331. Surely you could draw a sample of a certain amount from each churn and put them all together?—It would be very difficult indeed to get a very good sample in that way.

1312. No doubt public analysts know that as well as

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one churn out of the yield of 100 cows, because you might get the milk from a lot standing in a row, all calved at a certain time, drying off, and giving inferior milk?—Yes, that is quite right, but that is how all our samples are taken in London, and all the samples are bound to be taken in that way. I would not mind having an average standard fixed if we were summoned and prosecuted on averages, but we are not so. It would be very unfair to have a standard fixed if you take the lowest quality of milk, and the highest, and strike a medium, and say that shall be the Government standard; it would be very unfair, simply because we are not talking of averages. We are summoned on our samples; we are prosecuted on a particular sample, which might be taken at an unfavourable time; possibly it came out of a churn containing milk from half-a-dozen old cows that the farmer had—and it is a known fact that the young cows and the old cows are generally kept apart.

1333. (*Dr. Voelcker.*) You said if the milk gave 2·75 per cent. of fat you would be doubtful about it. That would be, even according to you, a low standard?—Yes, I should try to get the farmer to give more. I should try to get him to get higher, but I should not condemn that milk, and I should not condemn that farmer as sending milk which is adulterated.

1334. You would not condemn it even were you the magistrate, but you would not buy it if you were going to sell it again yourself?—Yes, I should.

1335. That is the inference I draw, I think rightly, from your remarks; if you have 2·75 per cent. of fat sent you you tell the farmer you will not have it any more?—No, I should not tell him we should not have any more; I should tell him we want a better quality milk and that he must try to get a better quality milk.

1336. I understood you to say just now you did not give him the opportunity?—You mistook me. When we stopped short it was not for the fat; it was for the non-fatty solids below 8·5—they were down to 8·0.

1337. But you would admit that you can also get a reduction of fat by the addition of water—that is, you could get a low fat by the addition of water?—Yes, certainly.

1338. If you get 2·75 of fat by the addition of water would you stop that? Would you say to the farmer that he was not to send any more?—I should not know that it was owing to the addition of water that the milk only gave 2·75.

1339. But you would have your analyst's report?—Quite so, but the farmer might have taken some cream from the milk and so reduced it to 2·75.

1340. If that figure of 2·75 was got by the addition of water and in such a way that your analysts reported to you, "This has got water added to it"——?—Then I should stop it on account of the water.

1341. On account of the water?—Exactly, not on account of the cream.

1342. Why should not the Government or the analyst on a similar basis stop similar milk from going into trade? What is wrong in their fixing such a standard as that and stopping such milk from going into circulation?—I should say it would be wrong; I say a low standard would be unfair.

1343. Then I may take it from you that 2·75 is too low in the interests of the public?—Not of fat, but anything below 8·5 of non-fatty solids would be too low. It is the 8·5 of non-fatty solids that I am speaking of more than the cream. That would give 11·25 total solids.

1344. If anything fell below 8·5 of solids not fat you would not have to do with it?—No, I should consider then that the milk was wrong—I should consider that it was adulterated.

1345. And 2·75, you have already told us, is not the amount that you would have your farmers sending of fat; you would tell them that they would have to improve that?—I said we should try to improve it, and so we should, although I said at the same time that we should not condemn that farmer as having skimmed the milk.

1346. And you would not consider yourself unreasonable in demanding of the farmer that he should improve over 2·75?—No.

1347. Then would you think it wrong of the Government or of the analysts demanding of the country generally that they should improve it, and give the public that improved quality which you yourself admit is the proper one?—If it could be done with justice, certainly; but it cannot be done with justice. You will have farmers summoned that were absolutely innocent. If you summoned them at all times for sending up milk with 2·75 of butter fat there would be from time to time and many times an injustice done to the sender.

1348. But you would agree that, while possibly injustice might be done, which, however, would be prevented by the reference we have spoken of, by the giving of such a low standard and fixing it absolutely as 2·75, you would hold that a very much greater injustice might be done to the consuming public by the fact of people bringing the milk down to that?—Yes, because I should say there is quite 75 per cent. of the farmers who send their milk to London who would be considerably above that standard.

1349. If there was a fixed standard of 2·75 there would be an inducement to mix or water down a bit?—Yes, I think there would be.

1350. And the fear of that would be very much greater than the fear of trouble to the farmer?—Yes.

1351. (*Chairman.*) Your man that you send back to when he does not bring up his milk to what you think it ought to be, if it is 2·75, and you say he is to improve it, what do you do if he does not do it; do you take him off the list?—It depends on circumstances; it depends how other farmers were sending their milk at the same time. It may be in the spring of the year when that might happen, just as the cows were giving very large quantities of milk, and the milk would naturally be poorer. If I found that one farmer was sending milk of that quality and all the rest of the farmers were sending it much higher at that particular time, I should deal with it, certainly.

1352. (*Dr. Voelcker.*) You have mentioned the case of cows at dairy shows. You know as well as I do that those are most illusory things, and that nothing whatever of importance ought to be attached to them?—I do not say that at all. I think there is every importance to be attached to them.

1353. You will acknowledge that that is not the general opinion even though you hold that?—I do not know. I am on the Council of the British Dairy Farmers' Association, and I should be very sorry to say that to our members. I think I should get a good roasting if I did. I say that dairy show cows are excellent cows, and they are brought into the yard for the purpose of producing an excellent quality of milk.

1354. They are excellent cows, but I think we have it on very good authority indeed that the conditions under which those cows are such, and the surroundings of the show are such as to upset the cows altogether, and make them yield abnormal produce?—No, that is not so. There are many cows standing side by side who are giving good quality milk, and the conditions would be the same for the one as for the other.

1355. One animal is affected in one way and another in another?—You can take the tests.

1356. I know those well; however, that is not your opinion?—That is not my opinion.

1357. It is your opinion that these tests are reliable?—Quite reliable—decidedly.

1358. Then with regard to the standard of milk in reference to its being carried about, that I take it has to provide for dipping as well as tipping?—I do not quite understand.

1359. You described one system as dipping and another as drawing from the churn, and I venture to call that other tipping?—Yes, I understand.

1360. Have you had any experience with regard to the transit of milk, and have you any views as to the desirability or otherwise of churns being locked when in transit?—Locking is not practicable; that has been tried. We have tried it again and again, but it is not practicable. But it is practicable to seal all the churns. We have a difficulty with some of the railway companies. I have a difficulty at the present moment with the South-Western Railway. The stationmasters from where the milk is sent object to the seals being put on to the churns. I am taking up that with the traffic superintendent at Waterloo now. We have just sent, I think, possibly 150 of our farmers some seals for that purpose.

1361. Got from France?—Yes.

1362. You have to get them from France, do you not?—Yes.

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1363. What is your view about the use of preservatives in milk?—In a limited quantity and under certain circumstances I do not see any reason whatever why a preservative should not be used if it is of a proper kind. It is much better to deliver sweet milk to the families with a very limited amount of preservative in than to deliver a milk that will go sour within an hour after they have had it.

1364. But you admit that if one person puts in a preservative and it passes to another hand, and he puts in some preservative, it may be wrong?—Yes, that would be wrong, I must admit that.

1365. What is to prevent that?—There is the analyst to find it out. If a sample of milk or cream is taken, and there is more than the limited quantity specified by the authorities, then the case should be dealt with.

1366. I beg your pardon, but there is no limit whatever?—I think there should be a limit.

1367. I should like that put down: You consider there should be a limit?—Yes.

1368. Would you go as far as to say, or would you object to it as a trader, that if any was put in it should be notified?—I should not think there would be any objection to notifying it to the buyers; I am afraid it would be often forgotten, though.

1369. (*Mr. Farmer.*) Do you consider that it would be practicable?—I do not think that there would be any objection at all to it, thinking over it.

1370. (*Dr. Voelcker.*) On the whole would you say that it would only be in exceptional cases that it would be necessary to use preservatives?—Yes. I am speaking more particularly of milk.

1371. I am speaking of milk in hot weather?—At this time of the year, when the weather is cold, and during the winter, perhaps, it would not be wanted, but we do get very bad keeping times during the winter; for instance, ten days ago it was as bad for keeping as in the heat of the summer.

1372. It was muggy weather?—Yes. I know one man now in Somersetshire who has sent for years beautiful milk, magnificent milk, and he has stated publicly that he has for years past placed in a little preservative. Owing to the fuss that has been recently made, and the prosecutions and so on, he has discontinued putting the preservative in, and, therefore, the trade has gone, and the farmers all round that district, I presume, have got to keep their milk at home.

1373. But you consider that there should be a limit to the quantity?—Certainly I do.

1374. And that the unrestricted use of it would be decidedly bad?—Yes, the unrestricted use would be. I have not very much experience in that. I take this position as a practical man. I say it is better to have a little harmless preservative than to deliver sour milk.

1375. When you, as a big trader, find it necessary to use it, you would have no objection to say so?—Not the least.

1376. With regard to cream, is the same applicable?—Yes, quite.

1377. Except that you would use it more generally with cream?—I take it the quantity would be a little larger than it would be in milk. I believe that the whole of the jar cream (which is making a magnificent revenue for the farmers) has been worked up and made through the cream being preserved. If it were not for the preservative I do not believe there would be that enormous trade for cream that there is at the present day.

1378. You would not object to notify it there?—No, I should not object. It would not make much difference to me, because I do not deal with it.

1379. Is it your experience that when the preservative is added to the cream the cream is sprinkled over on top or that it is thoroughly incorporated?—I have no experience as regards cream.

1380. (*Mr. Barham.*) You say, with regard to the use of a preservative, that it could be easily notified. Of course it could be easily notified from a farmer to the wholesale man, and it could be easily notified from the wholesaler to the retailer, but could the retailer notify it to his customers when he delivered the milk at five o'clock in the morning?—No, he could not; that would be impossible.

1381. Could he send a message out with his man, for instance, or how would you suggest that he should notify it? Should he send printed papers with every halfpennyworth he sold—he could not wrap the milk in a paper, could he?—It would not be practicable. I did not go so far as that. I was only thinking of the notification from the farmer to the wholesaler. I am not a retailer; I am a wholesaler.

1382. You looked at it from your own point of view?—Yes.

1383. (*Chairman.*) I am both, and I should have no hesitation in putting a label on the can in which the stuff was distributed to the public?—There would be 75 per cent. less milk required, I think; I am afraid it would frighten the public.

1384. You think it would?—I do think it would.

1385. Do you know Spiers and Pond's sell all their milk over the counter in a glass on which is written. "This milk is not guaranteed pure"?—Yes, I know that.

1386. And you and I, everybody who wants a glass of milk there, buy it just as much as if that notice were not put on the glass?—Yes, they do, but that is not a preservative which some people think is a poison.

1387. (*Mr. Barham.*) With regard to the preservative, supposing it is necessary to notify that milk contains preservatives, and you will be liable for selling the milk without notifying it, how would you ascertain whether or no the farmer had put any in before you received it and before you sold it?—It would be a difficult thing to ascertain.

1388. Could you ascertain it?—No, I do not think we could.

1389. If you received 500 churns of milk at Waterloo Stations to-morrow morning, and ten of those churns had a preservative in, how would you protect yourself from being treated as a fraudulent trader or as selling adulterated milk without declaring it?—We should have no means whatever of finding out. We could not analyse it; in fact, there would not be time to analyse the milk. We have to pick the milk up at the station and get it round to the dairies quickly in order to meet the times of the families.

1390. I see by your agreement you do not allow any preservatives to be added to any milk sold——?—That is quite right.

1391. Nevertheless, if any were sent to you, you would be liable?—That is so.

1392. You would have no means of testing it, no means of finding it out?—That is quite right.

1393. At least, not until you have sold the milk?—Quite so.

1394. If it were necessary to notify it, it would place you in a very difficult position?—Extremely.

1395. And considerably increase your present troubles?—Yes, it would indeed; that is quite right.

1396. Now, we have heard the cows at the dairy shows dreadfully disparaged. Are they not some of the best animals in the country?—They are some of the very best.

1397. Are not prizes awarded—there is a £50 cup which I have in my mind, which has been offered by my son—not only to the cow giving the largest quantity of milk, but also to the cow giving the best milk?—That is so.

1398. You, in your capacity as a member of the Council, have seen how these cows have been fed and treated at the dairy show?—Yes.

1399. They are all under cover there?—Yes, they are.

1400. And they are in as good a building as there is on any farm in the country anywhere?—They are quite as comfortable.

1401. They have their own herdsmen with them?—They have.

1402. They are well attended?—They are.

1403. The hay and the cake and the food that they have is the very best that money can procure?—That is so. They do it on purpose to get the quality of milk.

1404. As a practical man, and having been a farmer, as you have, so far as you have any knowledge of things, there is no earthly reason why those cows should not give as good milk there as they do at home?—There is every reason why they should give better in many instances.

1405. I will not ask you further with regard to the strata of a churn, so to speak, but I dare say you can tell us a little about the difference between the butter-fat at the top of a churn and the butter-fat at the bottom of

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a churn. I suggested yesterday to Dr. Hill that a great deal of the milk that is sold in towns—I suggested Birmingham, but he says it is not so there—arrives at the station at perhaps 9 or 10 or 11 o'clock, and stands there till 3 or 4 o'clock in the morning; is that so in London?—That is so—generally till 4 o'clock.

1406. Unless the greatest possible care is taken either to empty the whole of the milk in those churns or to stir them, the milk at the top will be very much richer than the milk down below?—Very much indeed.

1407. Then if anyone stole any milk from the top of that churn they would practically be taking almost all cream?—It would be the cream.

1408. That would, of course, to that extent depreciate the butter-fat in the other milk?—Undoubtedly it would, and very seriously too. Those cans unfortunately do not hold a pint; some of them hold as much, I believe, as nearly three pints—at least a quart.

1409. Of course, I cannot take you to Birmingham because you cannot speak of your own knowledge about Birmingham, but as a practical man you can speak as to the probability of it or not. It was said yesterday that milk in Birmingham was sold, the two meals, the morning's and the evening's, mixed together. I will not say anything about Birmingham, but what about London? Would you receive milk, as I pointed out yesterday, which was twenty-four hours old, or two meals' mixed together?—No, I think not; but if you notice in our contract we are very particular indeed that no two meals' shall be mixed together. We are very particular about that point.

1410. As a matter of fact, you make it a part of your business never to mix two meals' together?—We do, most certainly; we are very careful about that.

1411. (*Dr. Voelcker.*) As a practical man, if you wanted a cow to do its best, and you had it in the country, would you send it on a visit to the metropolis?—If I thought I was going to win a prize by sending it there I should, with the greatest of pleasure.

1412. Is it conducive to a cow giving a good quality of milk that it should be taken away from its ordinary surroundings and sent to strange surroundings?—I do not think that would alter the quality of the milk as much as the quantity. I think she may be giving a less quantity, but I do not think the quality of the milk would be altered unless she got into a very cold laying; if she came out of a warm shed on the farm and got into a cold place in the showyard where the wind was blowing, say, a north-east wind, and it was wet, then the quantity would be altered, no doubt, but not the quality.

1413. In your *précis* you say that the variations in the milk are caused by different pastures and feeding; would you think that your cow would improve with the fodder that was provided in the Agricultural Hall as against the nice feeding it had had at home to which it was accustomed?—The feeding it would have at home would be in the shed; the show is held in the Agricultural Hall in October.

1414. Is the fodder the same?—No, it is better in many cases.

1415. Would the yield of the cow and the cow's behaviour tend to improve when it had a crowd of people around it—I thought quietness was rather essential to a cow doing its work?—Yes, it is.

1416. Do they like a crowd?—Some of these cows have been to a show year after year.

1417. Now we come exactly to what I wanted; they are show animals?—Yes.

1418. They are trained to it?—Not by any means. You will find that the majority of the cows at the show, if you walk round, are chewing their cuds and taking things as easily and lightly and nicely as possible.

1419. You will allow this, that it is a very special kind of animal that likes to give its milk to the sound of a band of music?—I do not know; cows like music; they are very fond of music.

1420. (*Mr. Barham.*) Many of the milkers sing to them?—Yes.

1421. (*Dr. Voelcker.*) Will the cows improve by people going round and prodding them in the ribs?—That we do not allow at the dairy show; we are very particular about that. The cows that come to the dairy show are attended to and fed by their own man, and are quite at home there.

1422. Is it not the fact that these are all an artificial sort of animal, and the people who breed them and bring them up know precisely what animals will stand the test and what others will not?—No. That is proved by the number of cows which come into the show and go away without prizes or commendation of any kind. I have showed myself sometimes—I am not an experienced shower—but the animals go into the show and they have to take their chance, and there is no special effort made.

1423. You know you may have animals that will not stand the racket of a railway journey and of a show with all its surroundings, including a change of fodder, and that under these circumstances they will go back?—There are.

1424. Is it not notorious that if you take the shows of our local societies you will find constant records of animals going off their meal and getting ill?—That may be so in some instances.

1425. Is it not the case that men feed them specially for this, and in many cases give them things which they would not ordinarily have?—I do not think so. If they did they would upset the system of the cow entirely.

1426. Which they very often do; it is just a neat point—they bring it up to the brink where they improve the milk, and do not injure the cow?—They are most particular to feed the cow in the dairy show with the same thing that the cow has been used to feed on at home.

1427. (*Mr. Farmer.*) In the matter of preservatives would you have any more difficulty in dealing with the preservative in milk on the platform than you would have in dealing with skimming, and watering, and that kind of thing?—Do you mean with regard to analysing?

1428. I mean to say that you have not time when the milk arrives at Paddington to deal with any question of preservatives?—No, we have not time.

1429. Have you any time to deal with that question of stealing the milk or the cream, or whether someone has put a drop of water in it—the same difficulty arises in each case, does it not?—We have the lactometer for the water, and we have the cream glass for the cream, which gives us a rough and ready test.

1430. But you cannot use it on the platform?—Do you mean on the milk platform?

1431. Yes?—We can use the lactometer on the milk platform most certainly; we can do that easily enough. Besides, anyone who is practised in the trade can tell, when he is looking into a churn, pretty well by the rattle of it, whether it has got the cream it should have.

THIRD DAY.

Thursday, 8th March, 1900.

PRESENT:

Lord WENLOCK, G.C.S.I., G.C.I.E. (*Chairman*).

Mr. GEORGE BARHAM.
Mr. GEORGE COWAN.
Major PATRICK GEORGE CRAIGIE
Mr. S. W. FARMER.
Mr. SHIRLEY F. MURPHY.
Professor T. E. THORPE, F.R.S.
Dr. J. AUGUSTUS VOELCKER.
Mr. R. HENRY REW, *Secretary*

Dr. ALFRED ASHBY, called; and Examined.

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1432. (*Chairman.*) You are, I understand, a Bachelor of Medicine of the University of London, a Fellow of the Royal College of Surgeons, England, and a Fellow of the Institute of Chemistry?—Yes.

1433. You are also Medical Officer of Health of the Boroughs of Reading and Wokingham, and of the Rural District of Wokingham?—Yes.

1434. You have also been public analyst of Reading since 1887 and public analyst of Newark-on-Trent since 1882, and public analyst of Grantham since 1878?—Yes.

1435. I understand you are deputed to give evidence before this Committee by the Incorporated Society of Medical Officers of Health?—Yes.

1436. Would you please state to the Committee what it is you have to say?—Any milk standard that may be decided upon must not be such as would be reasonably liable to condemn milk which, although not very rich, is undoubtedly genuine. At the same time, the public ought to be protected by any standard from the possibility of milk being reduced to too low a quality, not only by adulteration, but also by impoverishment from other causes, such as disease or improper feeding or housing of cows, or the keeping of cows which are not adapted for the production of milk. The Incorporated Society of Medical Officers of Health is opposed to any very low standard for milk being fixed upon, and considers that the standard should be reasonably high. If a low standard were officially sanctioned the quality of milk throughout the country would tend to be levelled down to it, and the public would materially suffer in consequence. If, on the other hand, a fairly high standard be adopted, there would be no difficulty in keeping the general character of milk up to it; milk producers, with the aid of scientific knowledge and practice, would easily succeed in satisfying the requirements of such a standard by selecting cows of the right sort for milking, and by weeding out from their herds any cows which were found to yield abnormally poor milk. I am of opinion that the public have a fair right to protection in respect of such an important article of food as milk. This is a matter of special importance to the health and proper nutrition of infants, consequently affecting future generations, inasmuch as artificial feeding is so generally taking the place of the natural nourishment of infants. A milk poor in fat is injurious to infants when they have to depend upon it for their nourishment. I might say that the Society of Medical Officers of Health look upon this question very much from the public health point of view, and they think the matter is of very great importance. Samples of milk submitted to public analysts are almost invariably taken from mixed dairy milk. Any standard should be based upon the composition of such milk. It would not be reasonable to fix it by the composition of the milk of any single cows which, as is well known, occasionally yield milk of abnormally poor or abnormally rich quality, as the analysis of such milk practically never comes within the official work of public analysts. I am of opinion that the standard suggested by the Society of Public Analysts, namely, 11·5 per cent. of total solids, consisting of 3 per cent. of fat and 8·5 per cent. of solids not fat is perfectly fair and reasonable. Indeed, I believe the percentage of fat might be raised even a little higher without unfairness, though I do not suggest that that should be done. At the same time if a sample is unusually rich in fat, I do not think it would be right to condemn it if the solids not fat fell a little below 8·5 per cent. I believe I am right in understanding that any standard which is fixed upon will be regarded as presumptive evidence that any sample not coming up to it, as might possibly happen very occasionally, has been adulterated, so that it would still be open to a defendant in any such case to prove that the milk had not been tampered with, if that were the case. If there is to be an official standard for milk it ought to be based upon an official method of analysis. I consider that ought to be the method of the Society of Public Analysts, or any other method which can be conclusively proved to yield equally accurate and constant results. I do not give the details of that method because I presume that it will be explained to the Committee by the representatives of that society; but I shall be prepared to describe it if necessary. In order to ascertain whether the suggested standard can be easily reached, I have recently got an inspector to take samples of milk in course of delivery from farmers to purveyors of milk, and have analysed them. In no instances have the total solids fallen below 11·5 per cent., or the solids not fat below 8·5 per cent. I should say one went down to 8·48, which is practically 8·5. In most instances the fat has been well above 3 per cent., but in two samples of morning milk it has fallen about one-tenth of a per cent. below that figure. One fell to 2·94 per cent., which is less than a tenth of a per cent., and the other to 2·86 per cent. But even then there was no proof that the milk had not been tampered with, and, as I consider that proceedings should not and would not be taken in the case of such very slight deficiency. I think those instances should not be deemed to tell against the suggested standard for fat. My general impression is that in my part of the country at any rate, the suggested standard can be easily kept up to and even exceeded. I have tabulated the results of these analyses in a table which I hand in. (*See Appendix No. VI.*)

1437. You have handed in an analysis of the samples of milk supplied by farmers in the neighbourhood of Reading?—Yes. My object was to see the general character of the milk, as it is actually delivered in the town before it has any chance of being tampered with by small retailers and so forth. Fourteen of the samples were samples of evening milk, and in every instance those came above the suggested standard, except with the one slight exception of No. 6, which showed solids not fat 8·48, instead of 8·5—which is practically the same. The average total solids in those samples was 12·89, the average of the fat was 3·99, the average of the solids not fat was 8·90, the average of the ash was 0·75, and of the specific gravity was 1032·28. Of the morning milk, which is always rather poorer than evening milk, the average of the total solids was 12·23, the average of the fat was 3·36, of the solids not fat 8·87, of the ash 0·75, and of the specific gravity was 1032·57. The averages of the whole 25 samples were: Total solids 12·60, fat 3·71, solids not fat 8·89, ash 0·75, and specific gravity 1032·41. The two exceptions in the morning milk were Nos. 15 and 16—the two fats which I have already mentioned. They fell just under the selected standard, but I do not think that proceedings would be liable to be taken in such cases as that. The cows were not milked in the presence of anybody, so it does not at all prove that those were really genuine samples. These are just as they were taken, as they were deliverd to the dealers in the town.

1438. Were these samples taken out of the churn?—

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The inspector took most of them in course of delivery from the farmers to the purveyors of milk. In one or two instances he took them from the churn immediately on delivery at the places of the dealers, but in most instances they were taken in course of delivery by farmers on their way to the dealers.

1439. This would be the mixed milk of several cows in a particular herd?—Certainly.

1440. Would it be milk from an individual herd?—It would be from the herds that different farmers owned. Every one of these was mixed milk; not any of them was a single milk, because they were too large a bulk to be yielded by single cows.

1441. I should like to ask you if in your district you have many cases of adulteration brought to your notice?—A fairly good number; I should think perhaps 8 per cent. of the samples.

1442. Do you mean to say that 8 per cent. are proved to be adulterated?—Something like that I think.

1443. And do convictions follow?—Invariably. I should say that I have always acted on this suggested standard of the Society of Public Analysts. One case was lost, but that was during a very great drought. The fat there was 2·52, I think, and the vendor was prosecuted for abstracting fat. The excuse was the great drought. It was two years ago, I think, during the very great drought. That was an excuse which just sufficed, and he got off. But afterwards the same man with a little more fat in another dry time was prosecuted; I think it was 2·62 or 2·64; at that time the same man then pleaded guilty to abstracting fat, and he was convicted and fined. I have no doubt myself about the other time, but his evidence was ingenious, and he just got off. I might say also that in no case has any defendant ever disputed the results of my analysis—that is to say, they have never availed themselves of the opportunity of sending samples to Somerset House as a check analysis.

1444. Have they ever demanded an appeal to the cow?—No, never.

1445. Then you are satisfied that the standard suggested by the Society of Public Analysts would be a fair one?—Yes, certainly.

1446. I should like to ask you what your opinion would be in this matter; your experience shows that the average of the number of samples that you have dealt with both in the morning and in the evening considerably exceeds the standard you propose?—Certainly.

1447. Do you think that if that standard were fixed by law as you suggested at 3, there would be a watering down of the milk in your country to meet the Government standard?—I cannot say that there would be. In my opinion it would be utterly impossible to fix a standard that would absolutely prevent the chance of that sort of thing, because if you tried to prevent that you might fix a standard which would be unfair under certain circumstances.

1448. I am taking 3 per cent. as your own suggested figure for fat?—My impression is, as I have said already, that we should be prepared to go a little beyond that—perhaps to 3·25; but I do not suggest that. I think there might be cases where the milk would not exceed 3 per cent., though in the large majority of cases—the very large majority of cases—it is far above 3 per cent.

1449. I take it that the district which you know best, and have to work in, is a good dairy district?—Yes, I believe it is a very fair dairy district.

1450. And is representative of the dairy districts in the South of England would you say?—Yes. I also have milk from Grantham in Lincolnshire, and from Newark in Nottinghamshire—two other districts, and there I find there is no difficulty in keeping up to the suggested standard.

1451. (*Professor Thorpe.*) Are all these samples of milk obtained in the neighbourhood of Reading?—Yes—a few miles round, of course.

1452. Have you reason to believe that at this time of the year they would be substantially different from what you would obtain in the other districts for which you are an analyst?—I think not. I think they are very much the same in the different districts.

1453. Have you any reason to believe that at this time of the year, namely, from the middle of February to the present time, the milks are somewhat richer than they would be at any other time?—Yes; but they are not so rich as in about November and December; it is about a medium time now. About June I should expect them to be rather poorer; but certainly they are not so rich now, as they would be about November and December. A good medium time I should call this.

1454. In other words, you think that the analyses given in your tables are sufficiently numerous to represent the average composition as regards fatty and non-fatty solids of milk throughout the year?—I should have liked these to be more numerous, but of course I have in my mind many other analyses which I have made, but which I have not tabulated here. I got these out for a special purpose. My impression is that it is a very good representation of the general character of the milk of the district——

1455. Throughout the year?—Yes.

1456. What are the extremes in your experience between which milk during the various seasons would fluctuate?—Do you mean a real genuine milk?

1457. Yes.—I should say that you might put a half per cent. of fat variation; perhaps it would not go, as a rule, below 3·6 for the morning milk, and the evening milk is 3·99, practically 4 per cent. I think that in November we should probably get that average up to perhaps 4·50.

1458. That is to say in the evening milk in November you would get a proportion of fat as high as 4·50 per cent.?—Over 4, I think.

1459. You prefer saying over 4?—Over 4 I may say. I have not made any exact observations on that point in the district, but I should certainly say the average may be fairly taken at 4 now; and it might be considerably over 4 about November and December.

1460. Would the variation that you say takes place for the season equally affect the evening's and morning's milk?—I think there would be very much the same relative difference between the morning's and evening's at that time as there is now. I should put the general variation between the morning's and evening's in fat at somewhere about a half per cent—0·4 per cent. or something of that sort. In one instance it is only about 0·28, but I think at the outside you might put the difference between the morning and the evening milk, at 0·4 or 0·5 of fat. I think those relative proportions would hold good in the different seasons of the year.

1461. I suppose you have framed no estimate in your mind as to the probability—taking the year in and out, that is all through the year—of any sample of milk being as low as 3 per cent. of fat; what are the chances throughout the year that any one sample would be as low as 3 per cent.; have you formed any estimate of that?—I am afraid I have not.

1462. Are you aware whether the facts are sufficiently numerous to enable anybody to calculate the odds—because that is a purely mathematical computation—that any one sample of milk should be as low as 3 per cent. throughout the year?—I really do not know.

1463. You have no idea of any estimate?—No, I have not myself. Of course, they would want an enormous number of samples of mixed milks to make such a computation.

1464. Yes, but these are mixed milks?—Yes, I have not taken samples from individual cows, because my opinion is that you are not to be guided by that at all. As public analysts we never have them, practically.

1465. These, in other words, are all mixed milks?—They are all mixed milks. To get data of that sort you would want a very large number of analyses to make good your average.

1466. You are aware, are you not, that there must be at the present time many thousands of analyses made?—The Aylesbury Dairy Company have had 120,000 over a long time.

1467. There are data accessible then upon which to calculate the probability of anything as low as 3 per cent.?—Quite so; but then there is one thing to be said about milks of that sort. The Aylesbury Dairy Company have contracts, and they contract for milk with not less than 3·25 per cent. of fat. That shows that it could be kept up to, because they very seldom go below that, though perhaps those figures are hardly comparable with what we deal with throughout the country, because they say: "If you do not keep up to 3·25 per cent. of fat, we will not have your milk." The farmers do it, and that shows that it can be done, as it is done when there is that contract. Any farmer can do it I believe; it only wants a little science and care.

1468. (*Chairman.*) Do your milk dealers in Reading and the country you know stipulate for any guarantee?—I do not think so, but I could not say that for certain.

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1469. (*Professor Thorpe.*) Do they in any other part of the world with which you are acquainted actually stipulate for any guarantee?—I could not say.

1470. Now I gather that you wish to be loyal to the Society of Public Analysts?—Certainly; I am a member of it.

1471. But then I rather gather that your own private opinion is that the standard adopted by the Society of Public Analysts is rather low?—Of the two I should say yes; but I am not quite prepared to say that we as public analysts would always like to condemn any milk that has less than 3·25, for instance. I have been so used to taking the 3 per cent. as the standard that perhaps it may be something of that sort which influences me. I think I should not like very much always to condemn a milk that was below 3·25. If we can raise the standard, by all means do so; I should like to see it.

1472. But inasmuch as the machinery of the Act is slightly different from what it was, and the report now is only a case of presumption, and so enables a man to defend himself if he likes by other machinery, does that fact modify your view?—It does. If it is not a hard-and-fast standard that must be absolutely adhered to, I think that is all the more reason why we should try to raise the standard. I do not think that the Society of Public Analysts would be at all averse to any raising of the standard, though they have fixed this for years and years past as being what they thought was a reasonably fair working standard; if it could be fixed at 3·25 I should be very pleased.

1473. Would you kindly tell us, speaking in your capacity as an individual analyst and on the basis of your experience, what in your judgment would be a fair standard?—I think that 3·25 per cent. of fat would almost always be reached throughout the country if farmers will keep their cows under proper conditions, and will keep proper cows. I believe that whatever is fixed will be worked up to, because there is no difficulty, I think, or very little difficulty, with a few exceptions in very unfavourable times such as bad seasons for haymaking, excessive heat and drought, or long spells of cold and wet; under such circumstances the standard might not be quite kept up to always, but then, I think, we should use our discretion in those times, and have a little elasticity.

1474. (*Chairman.*) Do you think that on those occasions the Board of Agriculture would ring a bell and announce to the whole country that the standard was to be lower during that period?—It would hardly be possible.

1475. How are you to do it?—I mean to say for my own part in such times as that I should most certainly feel inclined to exercise a little more elasticity in any standard.

1476. (*Professor Thorpe.*) Is it not the fact, however, that you yourself do not initiate these prosecutions?—Certainly.

1477. They are initiated by a committee upon your report?—Upon my report, exactly; but I have to certify that in my opinion the sample is not genuine before they can do anything. It would come really from the public analyst, though the public analyst fortunately has nothing to do with the instituting of proceedings.

1478. Would not your certificate at these times be accompanied with such remarks as would enable the committee to judge of the expediency of instituting a prosecution?—Certainly, that would be very easily done.

1479. You are of opinion that if there is to be an official standard there ought to be an official method of analysis?—Undoubtedly.

1480. Who is to prescribe that official method of analysis?—I do not know whether this Committee has any power to do so, but there ought to be an authoritative pronouncement of what is to be considered a method of analysis, because supposing we went back to the old Wanklyn process, we know perfectly well that by that process a half per cent. of fat is left behind; 2·5 per cent. according to the old Wanklyn process is equal to about 3 per cent. according to the modern processes. Supposing, for instance, in any defended case an analyst was got to say: "I have analysed this milk" by that old process, which is no good ——

1481. But do you not see some advantage in allowing a body such as the Society of Public Analysts to accommodate themselves to the changes on which they alone are the best judges in the methods of quantitative analysis rather than entrust that to a public department, which is necessarily much more slow to move; do you not see a difficulty in a public department doing it?—Yes; if the official method of the Society of Public Analysts could be universally adopted, or some equally good method—any method that might be proved equally reliable and constant—well and good; what I mean is that the results depend upon the process of analysis. As I was mentioning just now, if we were to go and analyse according to the old Wanklyn process we should find that the fat was as we used to consider it, 2·50 per cent., and the solids not fat 9 per cent.

1482. But it is not your experience that the old Wanklyn process is used by analysts?—I hope not.

1483. You are not aware that it is?—I am not aware that it is. What I mean is this: supposing anybody wanted to be defended, and got some peculiar man to use that process, and say: "Here I have got such and such results."

1484. But that evidence would not be worth much on cross examination, would it?—It ought not to be.

1485. You are aware, of course, that the methods which would be available to Somerset House are not necessarily those which could be adopted, and would be adopted by the analysts in the first instance?—No; but I think it is desirable to have methods as nearly as possible the same.

1486. Why do you say that?—So as to get exactly concordant results.

1487. Does not that impose upon the general body of analysts a method which is alone applicable to the conditions of sour milk?—Not much; we never have sour milk.

1488. No, but you are eventually judged by sour milk, are you not?—Yes.

1489. Therefore if the two methods have to be in accord for the sake of proper corroboration surely it is desirable that analysts should adopt the method by which they alone can eventually be judged?—Yes.

1490. You agree to that, do you?—Very much, but——

1491. Why do you qualify it?—Because we do not always believe very much in the analysis of sour milk.

1492. Whenever a reference case is taken it must be on the sour milk?—We do not always trust it very much.

1493. Why not?—Because we do not think it is possible to get such good results as when the milk is fresh—whatever process is used.

1494. Have you seen the last volume of Mr. Allen's work?—Yes, I have got it, but I am afraid I have not read it all. You mean the "Commercial Organic Analysis"?

1495. Yes.—The American revised, the last edition.

1496. That is not an American work, is it?—No.

1497. Have you seen the chapter on milk analysis in that work?—I have glanced at it, but I have not read it carefully.

1498. You are not in a position, therefore, to say on the basis of that work that it is proved that it is equally possible to get the same results with sour as with fresh milk?—I did not know that.

1499. You do not know that it is set out in the book that that is possible?—No, I do not.

1500. You hand in this table of the analyses of samples of milk supplied by farmers in the neighbourhood of Reading, I assume?—Yes. (*See Appendix No. VI.*)

1501. There is nothing so far as you know in the method of selection of these samples which would in any way prejudice the case?—I think nothing at all. I told the inspector to take the samples as fairly as he possibly could to represent the milk as absolutely delivered to the producers.

1502. Assuming that a standard was fixed of 3 per cent. of fat and 11·50 per cent. of total solids would that not allow the possibility of an addition to the milk on the whole year's supply of from 3 to 5 per cent., or even more of water?—I think it would; but I do not see any possibility of getting over that difficulty by any standard which could reasonably be decided upon. I have often passed milks which I felt perfectly certain to have been adulterated, but I have been obliged to pass them.

1503. If that is your answer, you are suggesting to the Committee to adopt a standard which will allow of the uniform dilution of milk with water to the extent of from 3 to 5 per cent. throughout the year?—Yes. I suppose it would give you a chance of a slight dilution of water. I think the standard of 3 per cent. of fat would give a chance of a slight abstraction of fat undoubtedly. It is,

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of course, for the Committee to say, but I do not see, as a humble individual, how we could fix any standard that is not liable to that.

1504. This, however, I may gather from you—that you are strongly of opinion that the amount of fat should not be below 3 per cent.?—Most certainly.

1505. And for the amount of solids not fat the standard should not be below 8·50 per cent.?—Certainly.

1506. That you are strongly of opinion?—Certainly.

1507. (*Dr. Voelcker.*) The samples that you have had in your capacity as public analyst for Newark, Grantham, and Reading have covered all seasons of the year?—Certainly.

1508. And as a practical matter, taking the standard that you have mentioned, which is adopted by the Society of Public Analysts, you have never found any difficulty in working it?—Not at all.

1509. Do you think that it would be possible to have a standard which varied according to the seasons of the year?—Hardly. My own way of feeling would be that in those very exceptional seasons like we have had the last two or three years, when we have had excessive heat and drought, I should be a little lenient with the standards. I think that is the way to work it.

1510. Your experience of your brother analysts has been then that they are not altogether unreasonable individuals, and that they do take special circumstances into consideration?—I think we are only too anxious never to cause any unfairness whatever. That is my feeling. Of course we have to protect the public, or to try to protect the public; but we also have to be very careful against any unfairness.

1511. And in your official capacity you have always made a point of taking special considerations into account?—Certainly.

1512. Have the cases that you have established of adulteration, where conviction has followed, been all clear cases?—Very clear.

1513. As a member of the Society of Public Analysts you share, I think, with the majority of them at least, the opinion that what they understand by such figures as 3 per cent. of fat and 8·50 of solids not fat is that this is not a standard of a good milk?—Certainly.

1514. But that they are the limits below which the milk ought not to fall?—Most undoubtedly.

1515. And if anything lower than that was put you would allow that it would open the door to a great deal of adulteration?—Undoubtedly.

1516. Whatever standard is fixed, I presume that it would be impossible to prevent some tampering?—Certainly.

1517. And it would also be impossible for a public analyst to say exactly whether a milk was naturally poor or whether adulteration had taken place?—Certainly.

1518. Then with regard to the Society of Public Analysts, is it not the case that the difficulty that they have felt is not so much in coming to an agreement among themselves, but in getting an official imprimatur upon their decision?—Yes, very much so.

1519. And if some agreement could be got between them and Government officials it would be a very good thing?—Very good indeed.

1520. Something has been said with regard to sour milk. Analysts have not, of course, to do with this?—No.

1521. It is very often the case that where samples of sour milk have been submitted to them they have refused to certify them?—Certainly.

1522. And they have ground of justification in doing so?—Yes.

1523. Would you not rather be inclined to suggest that the people who have to deal with sour milk ought to settle themselves what analytical standards to judge it by?—Certainly.

1524. Hardly the public analysts?—No.

1525. It would be a matter of interest for the public analysts?—Certainly.

1526. But it does not come in their official work?—Not a bit. We deal with milk in its natural fresh state.

1527. (*Mr. Cowan.*) Could you tell in any sample that was brought before you for testing if there was separated milk added to it?—Only by judging the percentage of fat. Of course the separated milk will reduce the percentage of fat. But we cannot say whether the fat is deficient because it has been skimmed off, or whether because it has been reduced by adding skimmed or separated milk.

1528. Would the addition of separated milk add anything to the solids?—If anything the solids not fat would be a trifle higher. Taking off the fat from the milk would tend slightly to raise the percentage of the solids not fat, but the effect would not be very great in that respect. If anything the solids not fat might rise a little, and the fat would be below the standard.

1529. You spoke of milk in the time of drought being reduced in quality?—Yes, I did.

1530. Is there any difficulty, do you think, even in a time of drought, in getting a sample up to three per cent. of butter fat?—I do not think so.

1531. Not even then?—I do not think so. Farmers must understand that they have got to make their cows behave properly, and must not have things that will not produce what can properly be called milk. Of course, we know that some cows will go down to 1·8 per cent. of fat, but that is not milk.

1532. Do you have milk coming from a distance of 50 miles or more?—I think some comes from down beyond Newbury, about Kintbury way. I have had samples taken at a railway station sometimes that have come from a distance.

1533. Are preservatives used in milk coming from a long distance?—I will not speak with certainty about that, because there is no prohibition against the use of them, and I cannot say that I always take the trouble to see whether they are there or not. So I could not say offhand the amount of preservatives used in our district.

1534. (*Mr. Murphy.*) Can you tell me whether in arriving at 3 per cent. as a standard you have had regard to the condition of milk particularly at the present time, recognising that some farmers may perhaps do less well for their cows than they ought to do?—Of course, the 3 per cent. is based upon an enormous number of analyses of milk as it is. I should have been very glad if the farmers could be induced to produce better stuff, and I think they could if they liked.

1535. Those analyses have, I suppose, in very large part been taken during delivery in the towns?—Yes. Of course, dairy companies take it before delivery and after delivery, you see; but public analysts' samples are taken either in the course of delivery or from retail shops.

1536. Then some of this milk may have been tampered with?—Which milk?

1537. The samples?—The particular samples in the table I have handed in?

1538. No, I am not speaking of your particular samples. I understand the 3 per cent. is based upon the experience of public analysts?—Certainly.

1539. Some of the milk which has been taken for samples might have been tampered with beforehand?—Certainly, it may have been.

1540. Possibly by abstraction of cream?—Certainly.

1541. Or by the addition of skimmed milk or of water?—Certainly.

1542. If it were possible to exclude such milks as might have been tampered with; that is to say if it were possible to deal with milk at the time of leaving the farm, might the standard have been put higher?—I think so. That can be seen by such a concern as the Aylesbury Dairy Company, where they average nearly 4 per cent. of fat. There, I think, you may fairly say that they have milk that is not tampered with. Their results are a very good illustration of what can be done. I am not only speaking about the Aylesbury Dairy Company, but other companies which do the same. I think their experience is very valuable, because it shows what can reasonably be produced. I merely use the Aylesbury Dairy Company because I have seen the published figures of their results.

1543. Then to fix a standard it ought to be of such a kind as would lead to the institution of proceedings against people who tamper with their milk?—Certainly.

1544. If the 3 per cent. is based upon an experience gained from milk that may have been in some degree tampered with, is it not a low standard to take for the purposes that are in view?—I think it is now, but I think it is going rather far to say that it is based entirely on milks that may be tampered with, because we have had the advantage of the hundreds and thousands of analyses, say, of the Aylesbury Dairy Company. I mentioned those because Vieth used to publish those at our society regularly, and we know his results. Based upon that I think even that shows that 3 per cent. is rather a low standard; but certainly it ought not to be lower than 3. If it could be a little above 3, if it could fairly be done, I should be glad.

1545. The standard of the Society of Public Analysts —3 per cent.—is a little higher than it was, at least it is alleged to be higher?—That is entirely owing to the difference of the method of analysis.

1546. There is really no difference then?—Not the slightest. Years ago in the old Wanklyn's analysis days, it used to be 11·5 of total solids divided into 2·5 of fat and 9 of solids not fat. Owing to improved methods of analysis, that process has been discarded entirely, and we find now that that 11·5 per cent. of total solids is divided into 3 of fat and 8·5 of solids not fat. We have made no difference, because in those old days samples were judged on the standard of 2·5 of fat and 9 of solids not fat, instead of as at present.

1547. In consequence farmers are not being expected to produce a better milk?—Not the slightest—exactly the same quality milk.

1548. It is only a difference in the results of the analysis?—It is only that the process of analysis has been changed and improved—not that the cows have altered at all, not the slightest.

1549. Perhaps that is why you are thinking that in fixing any standard it would be well to say by what method of analysis the results had been obtained?—Certainly. No process of analysis ought to be recognised that does not produce as constant and reliable results, say, as the society's method or anybody else's method that is as good. I do not say there are not other methods as good; it should be any method which would produce concordant and similar results.

1550. And the public analysts, if that were done, would themselves, if they used another method, translate the one standard into the other?—Yes, quite so; if the standard was altered. But so far as I can see at present, I think we do not leave practically any fat behind now in the method that is used, so I do not think there is any chance of the standard being altered.

1551. You think that now it has arrived at a state of finality?—I think there are methods of analysis now in which practically all the fat is got out of the milk, which used not to be the case. That is what you want to be done—you want to get out all the fat, or practically all the fat, from the milk residue, so as to be able to divide it into fat and solids not fat properly.

1552. Could you suggest any definition of a process that might accompany the statement of a standard?—Do you mean a method of analysis?

1553. Yes?—I have mentioned in my epitome of evidence that I think that the Society of Public Analysts will be giving evidence here, and I think it will perhaps be rather more in their province to describe the process than in mine.

1554. (*Chairman.*) You have mentioned the Aylesbury Dairy Company; they draw their supplies mostly from the south of England, do they not?—I think so.

1555. And from herds in which there is a good deal of Channel Island cattle or cross-bred cattle?—I do not know whether there is much. They go west, I know, beyond Hungerford on the Newbury line. There is no reason why a few cows that produce extra rich milk should not be included in any herd. There is no difficulty in it, and there is no reason why it should not be done.

1556. We have heard of poor land and poor cows in the north of England; they do not have anything to do with the Aylesbury Dairy Company?—No, I should think not. I cannot speak with certainty of the Aylesbury Dairy Company. I should think they go out Buckinghamshire way. In fact, I know they do, but I should doubt whether they go right to the north of England.

1557. (*Mr. Barham.*) You say that you think the dairies can be considerably improved by the addition of Channel Island blood?—What I meant was that if a herd could not be kept up to the mark, it might be. For instance, only a day or two ago I was examining a farm for a dairy company. The farmer was talking about his contract. I said "you will have no difficulty in keeping up to that standard." "Well," he said, "if I do, I have only got to get a few Jerseys and put them amongst them." That is the way he looked at it.

1558. So that you think milk could be improved up to your standard by improving the breed of the cow, so to speak?—Certainly.

1559. By a few Jerseys?—Without a doubt. Take, for instance, fat stock, look how that has been improved by proper breeding, and that sort of thing. In the same way with milk—by proper selection and breeding, and proper feeding there would be no difficulty whatever in raising the quality of the milk.

1560. How long would you give the farmers of the United Kingdom to improve their herds in that way?—I should not think very long, because a very immediate improvement might be brought about by introducing a few rich milk producing cows into a herd.

1561. You have not calculated how many millions of cows there are in the country?—No.

1562. Nor how many it would require supposing, say, 10 per cent. of Channel Island cows were needed to improve the milk; you have not considered how many Channel Island cows would be wanted?—No.

1563. Nor whether they could be found, say, within two years?—But I am of opinion that these Channel Island cows are not wanted as a rule. I think there is no difficulty whatever in keeping up to 3 per cent. with what we have; but if under special conditions there is a difficulty then I say import a few rich milk producing cows.

1564. Do you think the public on the whole have a right to demand that a farmer shall produce milk of such quality?—I think it is a matter of very great importance for the health of the country.

1566. Can you tell me, as a medical officer of health, how far a quarter of one per cent. of butter fat would improve the health of the country?—No.

1566. Does not the health of the country rather depend upon the non-fatty solids?—No.

1567. I mean the bone and the sinew, and that sort of thing?—That does; but the feeding value of milk, especially for infants, does not. There is too much of the nitrogen compounds in cows' milk for infants. Human milk has much less of those, and if you go and dilute poor cows' milk down to what it ought to be to correspond to human milk, then you will reduce the fat much below the fat of human milk, which is about 3·6 per cent. That is very injurious. This bad system of rearing infants is becoming so very general that I think it is a matter of very great importance to the health of future generations that we should have a proper milk supply.

1568. If you were called in as medical officer, and a delicate infant was in the case, and you knew that child was being fed on rich, good milk, you would recommend that to be watered, would you not?—And very likely to add cream to it.

1569. In any case, you would recommend it to be watered?—The solids not fat in cows' milk are considerably greater than in human milk. If you watered down the milk to make a proper proportion of the solids not fat, then you get the fat too low, and you ought by rights to add cream for the infants, and sugar too, you see.

1570. You say if the fatty and non-fatty solids in the time of drought were below this standard—and you seem to express an opinion that they would be——?—I did not say would be.

1571. Anyhow, at a period of drought, at a time of very hot weather, and of very extremely cold weather, and so on, they would be affected?—Yes, as in the summer of last year, and the year before.

1572. You think it would be quite easy for the farmer to bring it up to the standard?—I think it would to the standard of 3 per cent.

1573. What steps would you recommend them to take for that purpose?—They should accommodate the food accordingly.

1574. But the food is grass; it is summer time we are supposing; the cows are turned out to grass?—Perhaps they would have to give them a little cake.

1575. So that in a case of that kind what would you recommend?—I do not think there would be, as a rule, any difficulty in keeping it up to that. I merely say that there is a possibility that under such circumstances occasionally, but not often, it might be difficult to keep quite up to the standard. I do not think we must assume for one minute that there is a difficulty, because during all those times I have analysed lots and lots of milk, which came well above the standard; it is only occasionally that there is a difficulty.

1576. This is the difficulty the farmer has in dealing

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with it. I am sure everything that you do is fair and very carefully thought out, and considered, and that you desire to do that which is right to all parties; but this is the farmer's difficulty. If the ordinary produce of his farm is not to be used, or if it is to be added to, that will considerably increase his expenses?—It might do during that time.

1577. Then he has to ascertain first of all that his milk is below the standard?—Yes.

1578. Therefore he must test it from day to day, because the mere fact of sending it to an analyst once a month would not help him a bit, because another two or three weeks' drought would probably cause his solids to be deficient?—But there are rough-and-ready methods now by which they can very easily get a very fair approximation of the amount of fat. I think they might adopt those. I think it is right that they should, instead of going by rule of thumb, know what they are producing.

1579. So that you recommend that every farmer should have a fat tester, if I may so term it—a Gerber or Babcock tester, or something of that kind, that he should ascertain roughly what the fat is, then that he should test it with a specific gravity instrument, and then use Richmond's scale, and thus get at the total solids?—Something of that sort.

1580. And that he should do that every two or three days, and ascertain where he is?—If he is doubtful about his supply, I think, if they were to put a little science into their business they could easily keep up to the mark.

1581. I daresay you know a good many farmers in your neighbourhood?—Yes.

1582. Are they men likely to learn this amount of science in time, or would you prefer that a new generation should come up?—If they cannot learn, there are always public analysts, and they can always send samples to them. I am sure public analysts are not an exacting body of men. Perhaps it would be better occasionally to send a sample for fat determination to them, or something of that sort, during those times of drought.

1583. Now you recommend 3 per cent. of butter fat being taken as the standard?—Yes.

1584. Clearly you lay it down so?—Yes.

1585. You further say that there were two samples of morning's milk which had fallen below that?—Scarcely below; just below.

1586. I notice that one of them was 2·86?—Yes.

1587. You say further that any analyst with a little judgment would not think of prosecuting for such a slight deficiency as that?—I think it is doubtful; I certainly should not.

1588. Then I take it you in your practice would not recommend a prosecution if the fatty solids were not less than 2·86?—I should not commit myself to that altogether. I think in circumstances like that, especially if it was in a doubtful time, such as a time of drought, I should probably say to the inspector "Look here; take another sample wherever you got that, and watch it." That would be the best way, I think, because the object of public analysts is not to get cases and to be always prosecuting people.

1589. It should not be?—Their object is to keep up the standard of the milk in their districts to a proper point.

1590. Then I take it we come back to the same thing. In a case where you obtain a sample of milk with only 2·86 of fatty solids in it, you would not institute a prosecution. You say "I consider that proceedings should not be taken in the case of such very slight deficiency"?—Certainly not in that other case, which is only 0·06 below the 3 per cent. I might say that I was away from home when I wrote my epitome of evidence, and had not my books to refer to, and I was writing from memory therefore. I was thinking it was not quite so low as 2·86. I should think a good deal before I certified for a prosecution there.

1591. I am sure you would?—Certainly. I think the better way would be to get the inspector to watch it, and see whether there was a change; if it was always like that, then there might be a difficulty.

1592. I suppose when a sample is brought to you in your laboratory you take from it directly the portion you want for analysis; you dip from it at once, do you not?—I mix it well up, of course.

1593. You mix it well up?—Yes.

1594. You are very careful to do that?—Undoubtedly, else you would very soon get wrong.

1595. Supposing a sample was brought into your laboratory, and it stood there for a quarter of an hour, or supposing you emptied it into a basin, and it stood, say, for 15 minutes, surely it would be necessary to mix it up again?—Yes, I should always mix it up.

1596. Although it stood such a short time?—I do not pour it out like that. I should take the sample out of the bottle after having well mixed it up in the bottle.

1597. But if you had poured it out, would you consider it necessary to mix it again?—I should stir it well up, certainly.

1598. Your inspector took these samples that you speak of, on which you largely base your evidence, from the milk on its way to the dairies?—Yes.

1599. The churns were full, I presume?—I believe so.

1600. Where did he take it from—the bottom or the top?—He was very particular to have it well stirred up; he always does that.

1601. Do you think it is possible to stir up the milk in a churn 3 feet high so as to bring the milk down from the top to the bottom, and up from the bottom to the top? Should you say that the sample which was brought into your laboratory was a fair sample?—I think you could stir it up. Besides, I think there would be very little difference between the time the milk was put into the churn and the time it got to the town; I do not think there would be much rising of the fat in that time. But I know he is very particular to stir it.

1602. You know the fat does rise very rapidly when the milk is warm?—Yes, but then they ought to cool it down to 60 degrees; they always do.

1603. Do you think most of the milk is cooled coming into Reading?—I think so.

1604. We have had it in evidence here that milk is not cooled which is sent in from the immediate district of a town, but is sent in warm, and is worth more money than cooled milk, which is looked upon as railway milk?—I don't know that.

1605. Supposing the milk has all been cooled at the farm, of course it falls from the cooler; you have seen the refrigerators, of course?—Yes.

1606. It travels over very slowly indeed, and passes into the churn, and the cream is rising all that time to a certain extent, is it not?—Experiments have been made many times to show the effect of milk standing, and it takes some time before much has risen.

1607. Then, of course, the horse has to be harnessed and put to, and that would take another interval, perhaps half an hour?—Yes; and then there is the jolting about, and that helps to mix it up.

1608. At the same time, you do not consider that the sample taken from a churn like that can be a fair sample?—It is the sample as it always will be taken.

1609. Exactly?—You have got to judge of samples which are taken under those conditions, and I do not see how you can get anything better.

1610. I mean for the purpose of your report, all your samples have been taken from the top of the churn, although the inspector has to the best of his ability caused the churn to be stirred up?—I do not know. Some of them may have had a tap at the bottom; I do not know, but I think it is not likely.

1611. Not in the wholesale business?—It is only when they retail it.

1612. Thank you; that is as far as I will go in regard to that?—I think those samples are fairly representative of the character of the milk.

1613. How long has the standard of the Society of Public Analysts been 3 per cent. of butter fat?—How many years?

1614. I did not mean how many years, but how many months or weeks has it been 3 per cent?—Years and years.

1615. I was under the impression that it had been 2·75 up to quite a recent period?—That was not ours. We have always worked to the 3 per cent., but we have been rather hampered by a certain standard of 2·75.

1616. I think it was Professor Thorpe or Dr. Voelcker, I am not sure which, asked you if a 3 per cent. standard of butter fat and 8·50 of non-fatty solids were adopted, whether that would not allow of a uniform dilution of from 3 to 5 per cent. of water?—I would not give the exact percentage, but it would allow of some dilution.

We have cases of 8·9 and 8·5, which would allow of just about 5 per cent. of water.

1617. But the question to you was whether it would not admit of a uniform dilution of 5 per cent.; you did not mean in your answer that it would I am sure—at least, I do not think you did, but I should like to be certain?—That is speaking of the averages?

1618. Exactly?—It would be a dangerous thing for anybody to try; where you get just the 8·5, then, of course, you would be shown up.

1619. Suppose a farmer uniformly diluted the whole of these samples, taking that one at 8·48, where would he be with his 5 per cent.?—That would show up; that would come down below the 8·5, of course.

1620. Where would he be with the 8·69, the 8·74, the 8·50; he dare not uniformly water that milk to bring it down?—Certainly not.

1621. That is a misunderstanding?—It is generalising too much to say that. I was asked a leading question, and I answered.

1622. So many leading questions are asked, I know?—That is a safeguard for the standard working very fairly though.

1623. What you really meant in your answer by that was that where the non-fatty solids are beyond a certain amount it is possible to water that milk down to whatever might be the standard?—Certainly; but where they come out, as they often do, just above the 8·5, then, of course, it would be very apparent.

1624. I will just put a supposititious case to you. Supposing you were a farmer supplying milk, and you had been fined twice, and the third offence would mean a fine of £100, do you think he, or you, at that time with your knowledge as a farmer could so manipulate your milk as to add just 5 per cent. of water without being found out, even if it were a good sample?—It would be difficult, I think.

1625. I think so?—It would be dangerous work.

1626. I am sure it would?—There is that safeguard for any standard being fixed—it would be a dangerous thing for anybody to tamper with a milk, because they would not know the exact result.

1627. Exactly; you have met a good many analysts in your time?—Yes.

1628. Most of them, no doubt, like farmers, are very good fellows?—Yes.

1629. But some farmers are not so good as others; some are strong minded, and that sort of thing, and have got ideas of their own, shall I say? Do you think all analysts are as broad minded as yourself?—I did not know that I was so particularly broad minded.

1630. Fair minded then?—I hope I am fair, and I think the very large majority of public analysts are, just as I am, anxious that no unfairness should take place.

1631. Still there are young fellows sometimes appointed as public analysts from college or from school, as the case may be?—Boys fresh from the schools?

1632. They must be?—Then you must give them a little time to get experience.

1633. Just another thing. You spoke of those milks as being from mixed herds, and you distinctly say, at least I think you do—I do not want to make this question too leading—but you say that you do not attempt to suggest a standard of milk judged by the milk of a single animal?—Certainly it would be quite useless for our purposes.

1634. That is to say if you did fix a standard of that kind, of course you would have to fix a low one for single animals?—You would have to go down to 1·8 per cent. of fat.

1635. So it is the mixed herd you would take?—Undoubtedly; it is the only standard we have, in fact, for the purposes of the working of the Sale of Food and Drugs Acts.

1636. What would you call a mixed herd?—I suppose you would have probably not less than six cows at any rate. How many would it take to fill a churn?

1637. You are quite right; it would be about 6 to 8?—Something of that sort, at any rate not less than that.

1638. Perhaps 10 it might even be—8 possibly?—It would be quite out of the question to get 6 or 8 "1·8 per centers," I should think.

1639. Quite right; but what I want to get to is this, that if a farmer had 50 cows, and 10 per cent. of his cows came below, I think you would admit there is a probability that 10 per cent. of his cows would come below this 3 per cent.?—I do not know; I do not admit it.

1640. I think it can be proved here in evidence that that percentage of cows at least does come below the standard you suggest?—Well?

1641. Anyhow, you would admit that some of the cows would give below the standard?—Then it is his business to find out what cows are behaving like that, and to mix his milk accordingly; the public must not suffer, because his cows do not behave properly.

1642. But you will further admit that at the present time farmers, as a rule, do not analyse the milk of each separate cow, and then put the cows in their respective order, so that they should get a fair sample of their milk?—No.

1643. If a man has five cows coming below the standard he might possibly put those all together?—But I think farmers ought to be expected to use reasonable precautions in their business.

1644. That means that the milk of each cow must be analysed, so that they can arrive at something like a properly mixed herd?—I think that using some ordinary precautions he should be prepared to mix up the milks like that. It would be very funny, I think, if he had all these low standard cows going together.

1645. You have read Richmond's book, I suppose?—Yes, I have seen it. It is such a mine of information that one cannot read it.

1646. (*Chairman.*) You were asked a question about the standard adopted by the Society of Public Analysts; it apparently was in 1885 that they adopted the standard?—I know it was some years ago, but I forget the exact year.

1647. (*Mr. Farmer.*) Can you say whether it is an ascertained fact that in times of drought the fat in milk does decrease, or is it only an assumption?—I will take one witness, Vieth, who has had a long experience at the Aylesbury Dairy Company; he has distinctly stated that he has some difficulty in keeping up the fat in very bad times of heat and drought. I go by his evidence.

1648. You spoke of the Aylesbury Dairy Company stipulating for 3·25 of butter fat?—Yes, and 8·75 of solids not fat.

1649. Do you know whether any other companies in London stipulate for that?—Yes, I believe so certainly.

1650. Are you aware that a very large number of companies stipulate for 3·25, and that the Aylesbury Dairy Company is not singular in that respect?—They are not singular, certainly not; others do it too I am quite sure.

1651. (*Professor Thorpe.*) I have a few questions still to ask you, which I ask simply because the opportunity we shall have of getting scientific evidence is a little restricted, and a great deal may turn upon the reference to Somerset House. Before, however, I pass on to the point I have in my mind I will just ask one more question respecting these analyses. You told us in your opinion from the time of the year they were taken, and for other reasons that you gave, these might be considered as representing the fair average quality of the milk throughout the year?—I think so from my part of the country.

1652. And also, you added, from such other parts of the country as you had personal knowledge of?—I think so. From the general character of the samples I get from the other parts, I should say so too, certainly.

1653. Would you kindly tell the Committee in how many instances in the examples you have given it would be possible to add from 3 to 5 per cent. of water to that milk without being detected?—Perhaps nine out of the evening milks.

1654. Now, take the other—the morning milks?—I will take it at not less than 5 per cent.; about 5 out of the 11.

1655. What is the net result? In how many of the samples, using any criterion you like, could you dilute the milk from 3 to 5 per cent. without the risk of detection?—I should say in about half.

1656. Can you tell the Committee very shortly the chemical changes which come over the milk in the process of souring?—Yes, you get the formation of acid.

1657. What acid?—Lactic acid. Then you get the formation of alcohol; of course it is curdling, and all that sort of thing. I think those are the chief chemical changes. There is a loss of sugar, of course, and some loss of total solids, which you would miss if you did not

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determine the alcohol formed and the acidity, of course, in the sour milk.

1658. We will take each case. Does the fat undergo any change in the process of souring?—I cannot say from my own experience, because I have not had much to do with sour milks.

1659. Do you know anything of the theory of souring? I am asking you as a scientific man?—I do not know that there is much change in the fat.

1660. You imagine that there is practically no change in the fat, is that so?—Practically I should say so.

1661. What element is it in the milk which undergoes any change in the process of souring?—The sugar.

1662. What change comes over the sugar?—Lactic acid is formed, alcohol is formed, and carbonic acid is given off.

1663. Is that change of sugar of milk under the action of a ferment fully understood?—Not altogether, I should say.

1664. In what respect is it not understood?—There are different bacteria, and their action may be different under certain circumstances, I think—it is not all due to one growth.

1665. But there is a specific organism, is there not, which is concerned in what is known as the lactic fermentation of milk?—There is; but I am not sure that other organisms may not produce lactic acid as well. There is what is called the lactic acid ferment, I know.

1666. Are there other organisms which may produce lactic acid?—I fancy there may be.

1667. Assuming that there are other organisms which may produce lactic acid from sugar of milk——?—The change would not always be exactly the same.

1668. Why not?—I do not know, but I think it is assumed it is not.

1669. By whom is it assumed—what is the authority for the assumption?—I only think I have seen it stated.

1670. Do you not know that it is possible to indicate the fermentative change of the milk sugar by a chemical equation as rigorous as that of any other chemical equation?—I think you may get approximately pretty near the mark, but I do not know that you can altogether——you mean by the lactic fermentation?

1671. The change which produces lactic acid is capable of being quantitatively expressed by a chemical equation just as precise as practically any other chemical equation?—Yes, I suppose it is.

1672. That is possible?—I suppose it is.

1673. The fat undergoes no change?—I do not think so.

1674. The sugar of milk goes into lactic acid?—Yes.

1675. And a small quantity of alcohol with the elimination of carbonic acid?—Yes.

1676. The alcohol can be determined with accuracy?—Yes.

1677. The lactic acid can be determined with accuracy?—Yes.

1678. The carbonic acid is not determined, but nevertheless the measure of it can be determined?—Yes.

1679. Then every quantitative change can be ascertained?—Yes, theoretically; but in practice I rather doubt whether it will exactly represent the original composition of milk.

1680. But you have no practical knowledge of that, you state so yourself?—Very little.

1681. Very little?—Some, but not much.

1682. What other element in the milk undergoes change?—I do not know.

1683. Is there any other; does the casein of the milk undergo any change?—No.

1684. Then the only element in the milk which undergoes change——?—I should say that in casein you may have putrefaction take place, possibly, and then you get nitrogenous changes. I do not see why you cannot have putrefaction of the nitrogenous constituents of milk.

1685. Do you get what you call putrefaction in what is ordinarily known as sour milk?—Well, I do not know—I do not see why it is impossible.

1686. Do you know that it occurs?—I cannot say that I do. There are so many of these organisms that I cannot think that there is a universal constant change.

1687. Taking you, however, upon what you do know, namely, that the milk fat undergoes no change?—No.

1688. That such change as the milk sugar experiences is capable of being precisely and quantitatively indicated, and that the casein might to a slight extent you say, but you have no knowledge of that, undergo a slight change?—Yes.

1689. With the formation of what?—I do not know—putrefactive——

1690. Putrefactive changes, do you mean?—I do not know.

1691. Now, does it not occur to you, assuming that there are no mechanical difficulties in the way of the analysis, that there is nothing *à priori* in the changes in the milk which a chemical analysis cannot overtake?—That is assuming that there cannot be any variation in these changes, I mean to say it is assuming that you have got nothing to deal with but the lactic acid ferment, and that it always behaves in exactly the same way, whereas we know that there are hundreds of different organisms, and milk teems with them, and I cannot see why we are always to say that this exact change is going to take place to the exclusion of any other changes.

1692. Now, what other change than the lactic acid fermentation does milk undergo?—I do not know. I am only saying that I think it is assuming a good deal to say that there cannot be any changes but this fermentation of the milk.

1693. There is the change in the milk which is known as the butyric fermentation, is there not?—Yes.

1694. What is that change?—Then, of course, you can get the determination of the acidity.

1695. Yes, you can determine the acidity. Now, this is the point I want to get at—why do you lead the Committee to infer that it is not possible to analyse milk which has gone sour by the ordinary lactic acid fermentations? What are the grounds for that belief?—It is only a belief. I do not think that we can say for certain that there is always one definite change which takes place. We know there are shoals of different organisms. We know that all these changes are due to the action of different organisms, and I do not see why we should give credit to the lactic ferment alone to the exclusion of the action of all other organisms.

1696. When milk goes sour in the ordinary process of souring, the change is solely the lactic acid fermentation?—As far as the sourness goes.

1697. What we mean by sour milk in the ordinary sense is the formation of lactic acid, is it not?—As far as the sourness goes, yes.

1698. But there is no other quantitative change going on; the fat remains the same; the casein, unless it runs into putridity, remains the same; the only change, therefore, is this formation of lactic acid, is it not?—It is generally assumed so, I believe.

1699. And on very good ground, I suppose. I yet do not understand from anything you have told us why it is not possible to analyse milk which has only run into the lactic acid fermentation. Would you kindly tell the Committee what the grounds for your belief are?—I think I must say it is a general impression only.

1700. A general impression, and you have made yourself no experiments on the subject?—No.

1701. And you are not able to say anything about it from your own knowledge?—No, I cannot say much from my own knowledge on it.

1702. (*Chairman.*) It is a mistrust in your mind of Somerset House methods?—It is a mistrust of the analysis of sour milk altogether—a good deal based upon results which have taken place.

1703. (*Dr. Voelcker.*) If you found milk gave 2·85 per cent. of fat, you would take into consideration before reporting upon it as being adulterated, other constituents besides the fat, would you not?—Certainly.

1704. You might be guided, for instance, by the amount of nitrogen?—Certainly.

1705. Did you ever hear of an analyst who did not mix up his sample well before taking it?—Never. I think he would be very much to blame if he did not, and his analysis would be worth nothing at all.

1706. Did you ever hear of analysts coming straight from school to be public analysts?—Not often.

1707. Are there not such bodies as the Society of Public Analysts and the Institute of Chemistry?—Yes, and the Local Government Board.

1708. Does not the Local Government Board insist upon the qualifications of analysts?—Certainly.

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1709. Is it likely that a man who did not know that he was to mix up his samples would be appointed?—He ought not to be—certainly not.

Mr. James Stirling, called; and Examined.

Mr. J. Stirling.

1710. (*Chairman.*) You are secretary and manager of the Glasgow Dairy Company, Limited?—Yes.

1711. And were president of the Glasgow Dairymen's Association from 1894 to 1899 inclusive?—Yes.

1712. You have come here to give evidence upon what you know of this particular subject, and apparently your evidence is to go mainly on the line of analysis of the milk?—Yes.

1713. (*Dr. Voelcker.*) What grounds have you for saying in your synopsis that there are great differences between the chemists with regard to analyses?—Practical grounds from experience. In 1894 the Glasgow Dairymen's Association were looking out for evidence for a Committee on adulteration that was about to sit, and we took a good many samples at that time, and duplicated them. On the result of that duplication I can here give you the findings. To corroborate the discrepancies I took samples the other day, and duplicated them between three public analysts in Scotland.

1714. I must ask you kindly to confine it to the question of public analysts, as they only have the authority to certify?—They are all public analysts.

1715. May I ask if they are all Scotch too?—All Scotch. The reason of that is simply to find out the ability or uniformity of our own analysts who are the judges of us in a local court. An English analyst is of no use for us in a local court.

1716. What year was this?—1894, first of all, and 1900 in the case of a few samples done a week or two ago.

1717. It is getting rather ancient history now, is it not?—It is just the one corroborating the other, I can give you the samples taken a week or two ago first if you wish.

1718. (*Chairman.*) Are the gentlemen to whom those samples were sent members of the Society of Public Analysts, practising in Scotland?—They hold public appointments, all three of them.

1719. Under the Sale of Food and Drugs Act?—Yes.

1720. (*Dr. Voelcker.*) And they are all men of professional standing?—Yes.

1721. There were six series of samples of milk taken, I understand?—Yes.

1722. Would you give me the circumstances under which those samples were taken?—The samples were taken in the presence of, and sealed by, James Stirling, secretary and manager, and Hugh Wilson, foreman, both with the Glasgow Dairy Company, Limited, on the 19th day of February, 1900. We were careful to empty all the milk into a large vat, and immediately it was all emptied we took the samples, so that it was thoroughly mixed. After taking the sample for one analyst we mixed the milk again, turned it over from one vessel to the other, and took another sample, and so on, to the third. Series No. 1 was returned by Analyst A to contain 3·75 per cent. of fat, 8·77 of non-fatty solids, and 12·52 of total solids. Analyst B returned 4·06 of fat, 8·75 of solids not fat, and 12·81 of total solids. Analyst C returned 3·90 of fat, 8·64 of non-fatty solids, and 12·54 of total solids. In series No. 2 A returned 3·08 of fat, 8·42 of solids not fat, and 11·50 of total solids. B returned 3·56 of fat, 8·33 of solids not fat, and 11·89 of total solids. C returned 3·40 of fat, 8·44 of solids not fat, and 11·84 of total solids.

1723. Were they different lots of milk in each case?—Each different sample was duplicated three times.

1724. (*Professor Thorpe.*) How many lots of milk?—Six lots of milk.

1725. (*Mr. Barham.*) There were six series of analyses?—Yes, taken at the same time.

1726. And all analysed by the same three analysts?—Yes.

1727. (*Chairman.*) On different days?—On the same day.

1728. The same milk?—Yes.

1729. Was it one vat of milk you kept on taking it from?—No, it was one vat of milk for each series of samples. One farmer's milk was put into a vat and used for Sample I. Farmer No. 2's milk was put into another vat, and that was Sample 2, and so on. Of each of these samples an exact duplicate was got three times from each vat.

1730. (*Dr. Voelcker.*) Do you know the number of cows contributing in each lot?—I did not take that exactly, but our own farmers supplied us.

1731. Was it the milk of a number of cows?—This is the whole supply of a number of cows—not less than 30.

1732. (*Mr. Farmer.*) In each lot?—In each lot.

1733. (*Mr. Barham.*) Series No. 3 we are to have now?—Yes. A returned it as 3·58 of fat, 8·98 of solids not fat, and 12·56 of total solids. B returned 4·44 of fat, 8·36 of solids not fat, and 12·80 of total solids. C returned 3·90 of fat, 9·03 of solids not fat, and 12·93 of total solids. Then in Series 4 A returned 3·93 of fat, 8·87 of solids not fat, and 12·80 of total solids. B returned 3·75 of fat, 8·89 of solids not fat, and 12·64 of total solids. C returned 4·15 of fat, 8·74 of solids not fat, and 12·89 of total solids. In Series 5, A returned 3·61 of fat, 8·94 of solids not fat, and 12·55 of total solids. B returned 3·43 of fat, 8·91 of solids not fat, and 12·37 of total solids. C returned 3·90 of fat, 8·90 of solids not fat, and 12·80 of total solids. In Series 6, A returned 3·59 of fat, 8·48 of solids not fat, and 12·07 of total solids. B returned 3·54 of fat, 8·70 of solids not fat, and 12·24 of total solids. C returned 3·75 of fat, 8·68 of solids not fat, and 12·43 of total solids. The difference in butter fat between the highest and the lowest return is in Series 1, 0·31; in Series 2, 0·48; in Series 3, 0·86; in Series 4, 0·40; in Series 5, 0·44; and in Series 6, 0·21.

1734. (*Dr. Voelcker.*) These are the greatest differences in fat?—Between the three samples in each series.

1735. (*Professor Thorpe.*) Did you make the same analysis as regards the solids not fat?—Very similar all through. The solids not fat, and the total solids are very much nearer. The fat is the one point that the big discrepancy takes place in.

1736. Do you hand in that table?—With pleasure (*see Appendix No. VII.*), and the certificates of analysis if they are wished; I have them with me. In 1894 a similar trial was made on behalf of the Glasgow Dairymen's Association. I was president at that time.

1737. (*Dr. Voelcker.*) What time of the year were these six series made, the figures of which you have given?—A week or two ago, on the 19th of February.

1738. (*Mr. Farmer.*) What is the date of the 1894 samples?—From September 26 onwards into October.

1739. (*Dr. Voelcker.*) It is very clear, whatever may be the difference of chemists' analyses, that as far as the supply of Glasgow is concerned the standard of 3 per cent. of fat would be a decidedly low one?—I have evidence further on to show that it would not be a decidedly low one, because even in these six series you find one had 3·08—so that is one black sheep out of six.

1740. But that being so low may be due to the wrong doing of the analyst, as two other analysts got 3·56 and 3·40?—That is so, but in point of law we may be prosecuted by that one analyst.

1741. At all events, if a standard of 3 per cent. were fixed there would not be any harm done there?—I am prepared to show that it would be an injustice.

1742. I am taking you on the evidence that you have given on these figures?—On that evidence it would. I may say in Glasgow the milk comes in warm generally speaking, and it is not refrigerated. Supposing it were put into a counter pan in the morning, and stood for a little while, even though the girl were stirring it a little, the bottom of the pan would not be as fat as the top, or the beginning of the supply. Therefore there would be a great danger of it falling down below 3 per cent.

1743. With regard to the total solids, a standard of 12 per cent. of solids would only do injustice in two cases?—Yes, in these cases, you see, the fat is very good—very high. While they may be prosecuted for water according to the standard. I am certain there is no water.

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1744. Is it your experience of the analysts of Glasgow that they do advise steps being taken upon such small differences as the difference between 12 per cent. and 11·89, or do they take such points as the highness of the fat into consideration?—I can only speak for one of the city analysts, who is also chemist for our company. He holds very distinctly that anything under 8·50 in solids not fat is adulterated with water, no matter what percentage of cream or fat there may be in it.

1745. I suppose care was taken to have these samples thoroughly well mixed?—Thorough care.

1746. Did any of these analysts to whom these samples were submitted have the opportunity of examining the samples which had been given to their brother analysts; was there any interchange of samples?—There was no interchange.

1747. Was anything done beyond this to settle the point as to whether anyone was distinctly right or distinctly wrong?—Nothing more.

1748. They had no opportunity, I mean, of proving or disproving the figures that they returned?—They had no opportunity.

1749. You are not prepared then to say that it has been conclusively proved that these samples were thoroughly representative, as handed to the different analysts?—I am prepared to prove that they are thoroughly representative.

1750. You are speaking there not as a person perhaps particularly experienced in taking samples?—I have had lots of experience in taking samples, and I have told you the manner of taking them, and I cannot suggest any better. I did not take it from the churn, but I put that churn into a large vat.

1751. I presume that that milk was filled into what?—Into small bottles.

1752. How was it filled—was the cork taken off and the bottle dipped into it?—No, it was taken up by a dipper from a forty-gallon churn.

1753. And then?—And then put into the bottles immediately.

1754. But you would allow that it would have settled the point—and settled it very much more satisfactorily as to whether there were these real discrepancies owing to the differences of the method of analysts if they had had an opportunity of having an interchange of samples?—I do not think so, because in talking to one of them he simply set it down—he said he was right, of course——

1755. They all say that?—He said the other men had other methods, and I said that was certainly an injustice both to the community and to the traders. His own explanation was that he always liked to do it according to the Somerset House way of doing it. These were his words—I may as well give you them: The other men seem to be a law to themselves. That is just the point that we want settled—that these men be not a law to themselves, not even the Society of Analysts, but that this Board should determine the method, and that it be one method all over the land.

1756. Then you are in favour of an authoritative statement with regard to analysis and the method of analysis?—The method, certainly.

1757. Your second point is the different results with the same milk by one chemist?—Yes.

1758. What evidence have you on that point?—This was taken in 1894 for the Glasgow Dairymen's Association. We sent two samples at that time, exactly duplicated, to one man. In one instance he returned 12·36 of total solids, 9·33 of solids not fat, and 3·03 of fat; and the same milk he returned at 13·53 of total solids, 10·57 of solids not fat, 3·06 of fat. No. 2 sample he returned as 13·46 of total solids, 9·70 of solids not fat, and 3·76 of fat; and the same milk he also returned as 13·11 of total solids, 9·71 of solids not fat, and 3·40 of fat. Another chemist was also tried with two samples—I may say that both those gentlemen were public analysts. The first sample the second gentleman returned as 11·90 of total solids, 8·90 of solids not fat, and 3 per cent. of fat; and the same milk he returned as 11·50 of total solids, 8·80 of solids not fat, and 2·70 of fat. Sample No. 2 he returned as 12·75 of total solids, 8·65 of solids not fat, and 4·10 of fat; and the same milk he also returned as 12·80 of total solids, 8·70 of solids not fat, and 4·10 of fat.

1758*. To take that last, that is not an instance of discrepancy?—In both instances they come very near each other, and in one sample and in another they are very far wrong; so that we can only depend in every second sample on a public chemist being right.

1759. Then you do not think much of public analysts after your experience?—I think plenty of them personally, but it is the practical results I do not like very much.

1760. Of these cases, too, you are only able to say that it is to the best of your belief that these samples were well taken?—They were taken under a witness—I have the witnesses here—and sealed properly.

1761. They were sealed?—Yes.

1762. When these analysts were informed of these discrepancies did any of them give any explanation, or do their samples again?—They were not acquainted with those discrepancies.

1763. They had not the opportunity of putting this right?—They had not.

1764. It might perhaps have been as well that they should have—it would have guided you a little in your future proceedings if you had given them that opportunity?—It might; but I do not think it would have made any good further than this—that I have learned from assistants in the laboratories that they do this work, not the public analyst. That is just the point I want to impress upon you. I do not believe personally that if any of these men did the thing themselves they would make that discrepancy, but the thing is passed round the board, and left to the apprentices. That is the belief that I have of the reasons for the want of uniformity.

1765. That is what they call the Scotch cutting system, is it not?—I do not know whether it is the Scotch cutting system or not, but it is the system adopted in both the countries.

1766. Are you aware, too, that a case has been recently decided where a certificate of adulteration is given that the analyst has to certify that he has done it himself?—I am aware; I am also aware of a case that fell through owing to his signing a certificate when he was a long distance from the city.

1767. These cases that you have brought up to us are of a certain amount of interest as showing that there may be differences between different men; but can you from them give any specific instances of where prosecutions have been brought about as a result of the inconsistencies of analysts, and where they have been wrongly brought?—I have not instances of that, but we have plenty of instances of cases being defeated in court, that is of the Crown being defeated through several analysts coming before the court and declaring that this is their result. We had one in Glasgow about three weeks ago, where an analyst from another quarter, a public analyst, declared in court that the result of his analyses brought the fat above the standard, not below. The sheriff justly decided: "Well, there are two men of equal standing; I cannot do anything in the matter."

1768. At all events, prosecutions have not been successful, and the prosecution of honest traders has not occurred through the discrepancies of chemists as far as you are able to hear?—I am not able to show anything of the kind, because the honest trader possibly would not take recourse to another analyst. It is a matter of ability. They may be perfectly honest men, and may go to the court with implicit confidence that the public analyst would do no harm. Another man is better educated, and he says I am not satisfied that this is right, and he tries another analyst; and you find the man who does that gets an advantage over the man who does not—and both may be perfectly honest.

1769. It is rather a delicate point, but may I ask if there exists in Glasgow any opinion as to certain chemists always analysing what is called high, as against others?—We have no actual authority further than those that I have given you recently.

1770. Take the case of a man who had a certificate given against him of low analysis, you may say coming below some standard—if he wished to bring forward evidence to show that the sample was better than stated, would there be any chance for him going to another analyst who worked by another method, and getting a higher result; is there any current belief to that effect?—There is no current belief, but I may say that this one who brought the standard above was not a Glasgow chemist; he was out of Glasgow, but he was a city analyst as well.

1771. This Glasgow milk is mainly, I believe, Ayrshire

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milk, is it not?—It comes from nine counties around Glasgow; the largest supply comes from Ayrshire.

1772. Taking them all round it does not show a bad quality of milk?—On the matter of the uniformity of the standard I have figures which may interest you.

1773. We want to discuss the fixing of a standard; but these facts or figures that you have brought up do not show anything against the 3 per cent. standard?—That is the next point, but what I have been at just now is regarding the uniformity of analyses.

1774. (*Professor Thorpe.*) Would you kindly hand in those figures which you have which show the discrepancy of each individual analyst?—Yes, with pleasure. (*See Appendix No. VII.*) I will leave the official results with you if you wish. The table I have handed in is an abstract, but I have here the real certificates of the analysts (*handing same to Professor Thorpe*). In 1894 the Glasgow Dairymen's Association set about taking what they considered a fair average of milk that came into the City. They appointed a Committee to visit certain farms around the City in all directions to get samples of milk milked in their presence, and from cows at all stages of lactation—from a month calved to seven months calved—and at all ages from three years to 14. I may say that this milk was taken in the afternoon of the day which it is well known is the fattest time. Of these 30 samples six, or 20 per cent., came under 3 per cent of fat. (*See Appendix VIII.*)

1775. (*Mr. Farmer.*) Are these samples of individual cows?—Yes.

1776. Not of herds of cows?—Not of herds of cows, but of individual cows taken from various stocks, and not taken from poorly fed or half-starved cows, as is commonly alleged.

1777. (*Dr. Voelcker.*) Are these statistics confined to single cows?—To single cows from several herds.

1778. Have you any statistics from herds?—Yes, I have.

1779. Do you mind giving me the ones from herds?—Yes. I was handed the other day the results of one of the largest purchasers of milk in Scotland—one of the creameries—showing 30 supplies for one whole year. Nine of these 30 are below 3 per cent. of fat at some period of the year, 11 touch 3 per cent. of fat, 3 touch 3·1 of fat 6 touch 3 per cent. of fat, and only one has a minimum of 3·4. Of those below 3 per cent. one supply has a minimum of 2·2, another part of the year the maximum is 4 per cent. of fat; another sample has 2·4 as a minimum and 3·6 as a maximum at another part of the year; and another sample has 2·6 as a minimum and 4·3 as a maximum of fat. There were five samples with a minimum of 2·8.

1780. (*Chairman.*) Do you think you could give us an abstract of what you wish to say?—I have the whole abstract here. Of the five 2·8 was the minimum, one had a maximum of 4·3 at a certain part of the year, another of 3·8, another of 3·6, another of 4, and another of 3·5. Then one supply had 2·9 as a minimum, and it reached 4 per cent. at another part of the year.

1781. (*Dr. Voelcker.*) Would you give us the number or the percentage that fell under that figure 3 per cent.?—Nine of the 30 were under 3 per cent.

1782. Morning or evening milk?—They are both together.

1783. (*Mr. Barham.*) The two meals mixed together?—Yes.

1784. And brought into the factory or the creamery once a day?—Brought into the creamery once a day.

1785. (*Chairman.*) Can you tell me if the people who supplied milk are paid on a percentage of the fat?—They get a bonus on a certain percentage of fat.

1786. And if it falls below that they call a short price?—A little short price.

1787. So the public in these particular figures you are dealing with are not injured?—They are not.

1788. (*Dr. Voelcker.*) It is not milk supplied to the public?—It is milk supplied to a public creamery.

1789. (*Mr. Cowan.*) At what time of the year are the samples lowest in fat?—January and February are the lowest times of the year.

1790. (*Dr. Voelcker.*) What does a factory do; does it take any milk that is sent to it regardless of its quality?—It buys the full supplies of the dairies round about the factory.

1791. Does the factory not test it themselves—have they not a standard of their own?—They test it every week. The principle is that they get a bonus if they come up to a certain standard.

1792. What is the standard?—I really could not say; I did not inquire as to that.

1793. That is very material for us?—One of your Committee would be very efficient in telling you what that is; he must be well acquainted with the district—Mr. Cowan I refer to.

1794. Supposing a milk is found to come below that standard, what happens?—What happens to the purchaser?

1795. To the person supplying it?—He gets the minimum price—that is, the price without the bonus on it.

1796. Is the milk taken all the same?—The milk is taken all the same and manufactured.

1797. He is never told he must not send milk of that quality?—I cannot say as to that.

1798. You are not prepared to say?—No.

1799. (*Chairman.*) All those figures go to show that a large quantity of very poor milk is supplied to a factory?—That is so. They are valuable in so far as showing the result of thirty individual farms for one year and from one of the largest purchasers in Scotland.

1800. (*Dr. Voelcker.*) But this is not the milk supplied by those farmers that finds its way to the public?—Some of it does, but very little; the separated milk finds its way to the cities.

1801. These milks of which you have given us the particulars were all milks sent into the factory, but of which a very small portion found its way into general consumption by the public?—In summer almost none; in winter a fairly good proportion.

1802. Would you give us the average percentage of fat in the different cases that you have—the average of the whole of your single cows and of the herd; over what period do those go?—These thirty samples taken by the Glasgow Dairy Association were taken in September and October, 1894, and the average was 3·49 of fat.

1803. Was only the fat given, or can you tell us the total solids as well?—The total solids not fat averaged 9·30 and the total solids 12·82.

1804. And what is the average of the herds?—I have not averaged them. I began it but I had not time to finish it before leaving Scotland. The figures are all there, so that it can be totalled up. The average is fairly high; but the fact remains that nine out of the thirty are under 3 per cent. and six of the thirty or 20 per cent., in the case of the single ones, were under 3 per cent. It is afternoon milk, not morning milk.

1805. Does the morning milk come lower?—Yes.

1806. Do you call these cows that gave below 3 per cent. good cows?—They are good cows for an average stock; they are not cows that you could call half-starved or sickly cows.

1807. Not first-class cows?—They are really representative stocks round Glasgow or taken from representative stocks round Glasgow. I have given in the table their age. They cover all ages, from three to fourteen years, from a month calved to seven months.

1808. If the average is 3·49, that is well above 3 per cent.?—That is so, but it is quite possible that the milk of these six cows that are under 3 per cent. may be put in one churn, and a perfectly honest trader may sell it as he gets it. I have an analysis here of morning's milk.

1809. There must be a good deal of difference between the different cows?—There is 20 per cent. of these stocks under 3 per cent.

1810. Is it any hardship to expect the farmer to have better cows?—It would not be any hardship from the consumers' point of view if the Board were to say, "We will give you compensation to put out those cows that give milk with fat under 3 per cent."; but the fact remains that there they are, and in the creamery results there are nine out of thirty, almost a third, below 3 per cent., while in the individual results there are six, or 20 per cent. It remains a big order for any Board to say, "We will force the farmer to put these cows out of his stock." In the case of this dairy company near London that have so many thousand samples, the Aylesbury, I consider that that is no fair criterion at all, because in our case we do not produce the milk. If we were producing the milk as a company we, for our own benefit, would not tolerate cows that give milk under

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3 per cent., just in the same way as the Aylesbury Company do not tolerate it. In our own case we have individual farmers sending into the city. They have average stocks, possibly suffering from former generations, and there they are, and it is a big order to get them to weed them out.

1811. (*Major Craigie.*) Largely Ayrshires?—All Ayrshires.

1812. (*Dr. Voelcker.*) I put it to you—Is your factory a fair criterion of the quality of milk that is sent into consumption as milk?—I should say it is, only this—that possibly our basis of contract is a little more stiff. I may tell you that in Glasgow they have rather old-fashioned ways of buying milk. In some instances there is no written guarantee at all. In our case we enforce the written guarantee that it shall be the whole produce of the stock and the best quality they can produce.

1813. You have no evidence to show that where you get below 3 per cent. it has been genuine milk; you have only the statement of the fact?—We have had the dealing with the farmer whom we know to be perfectly honest.

1814. You have no evidence to show that it has not been brought down to that before it comes to you?—In these thirty samples we have complete evidence that 20 per cent. were under; they were taken under view of witnesses and sealed in presence of witnesses.

1815. Where were they taken?—In the byre. There is no doubt about these thirty.

1816. (*Mr. Farmer.*) Those are individual cows?—Yes.

1817. (*Dr. Voelcker.*) What about the herds?—Of course, that is taken at the factory.

1818. That was sent to you, and you do not know what happened to it before?—I do not know what happened to it before. As to the morning's milk, you were asking about that, and the evening milk; we got scared once by a supply being sent in that came under 3 per cent. from a very representative farm in Scotland. It happened to be a Dairy Institute. The professor of that Dairy Institute was very sore at me when I wrote to him about it, and he analysed it for his own satisfaction the following Sunday morning that it was sent. His results show that in three tins—that is three churns—two averaged 3, and one averaged 3·20, the total average of the whole supply was 2·90 of butter-fat. The original certificate was destroyed some time ago, but I have here an authoritative statement of it. The difference between morning milk and evening milk is also very well shown by Professor Carroll of Glasnevin. You are possibly aware of his results as to morning and evening milk. Eight cows were selected for a whole six days——

1819. I do not think we need go into that now?—It is just to show the difference between the two; possibly you will have evidence on that point. I want to emphasise the point that the morning's milk is poorer than the evening's milk.

1820. You do not advocate any standard for skimmed separated milk?—No, I do not.

1821. But you do for cream?—Yes, I do for cream. I would rather not for cream, because it is of such a variable quantity, but if the Board are inclined to fix a standard I cannot see anything reasonably can be done except within limits.

1822. We would like your views on the question of whether it is desirable to fix a standard for cream or not?—I should say that it is not desirable, and that cream should be bought like boots and shoes, according to quality, as it is bought just now.

1823. Have you any view on the question of the addition of such things as gelatin to cream to make it look thick?—It is not known in Scotland.

1824. They are above such things?—It is not known in Scotland; I do not say they are above it or below it.

1825. With regard to the addition of preservatives to cream, are they known in Scotland?—Yes, they are, but not so much as in England, because we do not go in for the jar cream to the same extent, and it is not needed.

1826. Is it your view that preservatives are required for cream?—No, I favour the pasteurisation of cream which does away with the necessity of preservatives.

1827. Even in very warm weather?—Yes.

1828. The use of preservatives in the sale of milk hardly comes within your cognisance?—I favour pasteurisation there against preservatives.

1829. (*Professor Thorpe.*) With respect to these analyses which you have put forward as evidence of the discrepancies which may occur between individual analysts—understand I hold no brief for the analysts—there are one or two points which occur to me to ask you. I notice that in the case of one analyst—I do not know whether it is A, B, or C—the samples were received upon the 20th February and they were reported upon on the 20th February?—Yes.

1830. Did you say anything to lead the analyst to infer that anything in the nature of a contract was pending upon his decision?—I simply asked for his careful analysis of the samples sent him, and I use that form regularly to our own analyst.

1831. What should have led him to this undue haste, that he reported on twelve samples on the same day in which he received them?—I believe the analyst referred to has a system on which he prides himself in being alone in the kingdom a rapid analyst. I do not know whether you are aware of it, but he contributed a paper on the subject to the Journal of the Society of Chemical Industry, and has distributed that pamphlet pretty widely, in Scotland, at any rate. He has a special system of rapid analysis which he claims as his own method.

1832. The special system, I may put to you, of rapid analysis may be perfectly suitable to decide, we will say, between A, B, C, and D, as to which is the better sample of milk to purchase—even an approximate system would enable you to determine which of several contractors was most advantageous to you to deal with?—That was not the object with which I sent the samples at all.

1833. Precisely, it was not the object with which you sent them, but might not the analyst reasonably infer it was the object for which you sent them?—No, certainly not. You will see those results are very carefully tabulated there. I sent asking for his careful analysis. I could do nothing more; I did not want any other analysis than his careful analysis.

1834. I repeat that I hold no brief for the analysts, but it is a little unfair, in point of equity, to put a number of samples to a gentleman to ask him to determine which of them presumably is the best milk for your purposes as a dealer, and then to test the results gained under that impression?—He was not asked which was the best supply. As far as I can remember the letter I sent him it was to the effect that I had sent him per post to-night a certain number of samples of milk, of which I wanted his careful analysis. He was not hurried in the matter in the very least degree.

1835. May I point out to you that all those certificates that you have handed in bear that complexion—that the analysts have apparently been under considerable pressure to get the work done within a very limited time?—There was no pressure; but I will hand in the letter to the Committee for their perusal, should they wish it.

1836. Are you in the habit of consulting analysts as to which among particular traders you should secure the milk from?—No, I am not in the habit, further than referring to our own analyst occasionally any milk that may be suspicious that comes in.

1837. Then may I ask how do you purchase your milk from the various suppliers of it?—Our form of contract is that it shall be the whole product of the stock and the best that they can supply. Of course, we work away for our own satisfaction with a little Gerber tester, and anything we think is a little suspicious we send to our analyst.

1838. I put it to you that here is a return, samples were received on a particular day, and the report was issued within the course of the same day; I do not know, of course, what the resources at the disposal of this gentleman are, but that is a feat which, I venture to say, the Government Laboratory would not undertake?—Still, if you were to be a criminal on account of that man's haste, I fear you would put a different complexion on the matter.

1839. That is the whole point?—Yes, that is the point.

1840. There was nothing to indicate to that gentleman that any legal proceedings were hanging upon this?—I do not consider that it is necessary that any indication should be given to an analyst at all, in sending a sample, further than "a careful analysis is wanted." Rather, I think that it is putting prejudice in a case to hand a sample to an analyst and say—Look for water or look for boracic acid. I do not think that should be necessary at all, if analyses of milks are an exact science at all. We can do the rest at home, you know, with a Gerber tester.

1841. I put it to you that you are implicitly making a reflection upon the analyst that he would be equally careless, we will put it like that, if he had to deal with a pending criminal prosecution. This man might have acted in good faith, and thought you wished him to advise you which of several samples of milk it was to your advantage to purchase?—No, that was not what I did at all.

1842. I say he might well imagine that to be the case, and, therefore, a very approximate determination of the composition of milk would be enough for that purpose?—That was not what I paid for. The point cuts both ways, because, suppose I was to get a sample from the Public Prosecutor for reference, was I to send it to that man and say I wanted a sample for the special purposes of the Court. He is just as likely to be prejudiced in my favour because I paid him. That is the point.

1843. The point is this—it is scarcely fair upon a man to say that he does not take care when the fair fame of a trader is at stake. Now, it is a matter of common knowledge to me, although I have to review these gentlemen's work in my official capacity, that they do take reasonable care; they make mistakes occasionally; of course, we are all apt to make mistakes, but they do take reasonable care where the fair fame of a trader is at stake. I do not say that it is required that they should take the same amount of care where it is a case whether A's or B's milk is to be preferred; a very approximate kind of analysis is sufficient to allow that kind of inference being drawn?—Of course, you are presuming that I am saying these men are unfair and have been careless. I never did presume, and do not presume they have been; and I daresay, if you had them here, they would all say they had been exceedingly careful—in fact one of them did.

1844. In fact, so careful as to adopt the Somerset House methods—which he said distinctly he adopted?—I say it is a weak point. These men should act carefully, and I do not assume that they have not been careful and have not given a careful analysis—I do not admit it for a moment.

1845. What is the implication of this, then?—That he is rapid in his methods.

1846. That is carelessness?—And has got different results from any other.

1847. If he is unduly rapid in his methods that is carelessness?—He is not unduly rapid. It is said a chemist can do one sample a day, and surely he can do six samples as easily as one.

1848. I do not care to press this point, but when I look at these certificates they all bear upon the face of them the fair inference, it seems to me, that somehow or another this gentleman has been under a misconception as to the object?—Just look at the other one; you see he has been five days in doing it. You are rather unfair, I think, in talking of haste; take the other one too and balance the two.

1849. I will take the other one; he received the samples on the 19th February and he reported on them on the 23rd?—Yes.

1850. When was the 19th February?—On Monday, I think.

1851. Of course, four days from the 19th to the 23rd would be a reasonable time in which to make these analyses. Now, I have examined these results very carefully to see if there is anything underlying them in the nature of a constant error—whether, in fact, I could make any inference that the results were affected by some particular method of analysis, because we have had it in evidence, you know, that a particular method of analysis does somehow or another affect the results; you heard, no doubt, what Dr. Ashby stated as to the effects of a particular mode of analysis?—Yes.

1852. There is some indication that there is some constant source of error depending upon the selection of a particular method—in other words, it seems to me, looking at them, that it does not necessarily reflect upon the character of the gentleman as an analyst, it only seems to indicate that he has selected some particular way of doing his work, and that particular way has been attended with some constant error. I gather from your *précis* that you think it would be a very desirable thing that some official method of analysis should be prescribed?—Yes.

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1853. And hence you are of opinion that any case which is brought into Court—I gather that is what you mean ——?—That is what I mean——

1854. Should be the personal work of the gentleman who gives the certificate?—That is so—of the person appointed under the Food and Drugs Act.

1855. I have not gathered—I may have been inattentive—that you have given the Committee your idea as to what the standard of sweet milk should be?—I have shown that it would be dangerous at the present rate of things to raise it above 2·75.

1856. As I say, I may not have paid attention; will you kindly indicate why in your opinion it would be dangerous?—Because of these results that I have handed in. In one instance of thirty cows six were under 3 per cent., and in these large results from the creameries in one year, nine, or nearly a third, were under 3 per cent. at certain parts of the year.

1857. The thirty cows were individual cows?—Yes.

1858. I suppose the milk supply of Glasgow is not from individual cows?—No, it is not.

1859. And we have, therefore, as practical men, to deal with the fact that milk is supplied from herds; it is a mixed produce that we have to deal with?—Yes, but not thoroughly mixed, you must understand, as I have shown the discrepancy in different churns.

1860. "Not thoroughly mixed"?—The produce of these six poor cows may be located in one churn, not known to the farmer and unknown to the trader.

1861. But surely that is a matter of detail which is under the control of the farmer. He might so arrange the admixture of his milk as to get a fair average from the milk, might he not?—Yes, but it is things as they exist that we are dealing with.

1862. You cannot minimise the whole standard of the milk supply of the country from the fact that a man does not take reasonable pains to mix the produce of his herds?—You must understand that around Glasgow the trade is done very early in the morning. They go in for warm milk; they are up at half-past two, and the hurry is to fill their churn as it is milked. A great many of the farmers would require a very large vat to mix it all in before filling the churns; it would mean a considerable expense, and it would mean enforcement or compulsion on the part of someone.

1863. But, supposing a number of churns were in the process of filling—not that you fill one churn and then send that away, but that you had a number in the process of filling—would that not tend to produce a better average?—If it was all put together it would.

1864. I do not advocate putting it into one vat, mixing it up, and drawing from that; suppose a number of churns were being filled simultaneously—not that one churn was filled up with whatever milk was being produced—and then closed and sent away?—That would be an improvement, but I do not know that it would quite overcome the difficulty, because you imply that the farmer is going to be careful to put in the exact quantity in each. Carefulness is not one of the things that a farmer is blessed with.

1865. We hope that he may be induced to exercise it more than he has done in the past?—I am sorry to say he does not.

1866. The consumer has no right to demand more than the average results, but he certainly has a right to demand that?—More than the product of the cow.

1867. More than the average result?—More than the product of one cow.

1868. He has the right to demand more than the product of one cow?—No.

1869. That is a matter of opinion, and I will not argue that. I put it to you, can you really fix a standard by the limit which one poor cow will afford?—I am not going to acknowledge that it is poor cows that gave these 1·8 samples at all, because, as a matter of fact, at our milking competitions, where extraordinarily good cows have got a fright or have been excited in transit, they give these abnormal samples, but they are not the product of the poor, sickly, starved cow.

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1870. That is an absolutely abnormal condition of things?—Exactly so.

1871. I think the test from milking-shows, milking competitions, is absolutely abnormal. We have had that before us, and this Committee has ruled that out of consideration as being so absolutely abnormal that it ought not to be taken into consideration?—The morning milk is a great factor. It is quite a common thing, as soon as they find they do not pay in quantity of milk, to buy in fresh cows; it is quite a common thing for six, or eight, or more to be bought in a market on a particular market day and brought home to the stud. Then you will have one morning, I am absolutely certain, on which the milk will be very poor from these cows brought in, standing and roaring in strange quarters. It cannot be repeated; the next day you cannot go and take a second sample from these cows, because they have all got used to their quarters, and have got accustomed to the new state of things.

1872. These are abnormal, and you cannot regulate the whole trade of the country by an accident?—It is for you to say what is a fair average of the whole.

1873. That is what I wish to get, and no more?—I should say 2·75.

1874. You have not made out any clear case why it should be that particular amount of 2·75?—Because I think I have shown you that, even with average milks, there are nine suppliers there who had one or two weeks of the year under 3 per cent., some of them coming as low as 2·2.

1875. Looking at the thing from the point of the consumer, if you are going to fix the limit on the individual cow I do not see why the consumer should not demand the high limit; you say he ought to be content with the low one?—I did not say I would fix it on the minimum cow. I should say that was all the purchaser had a right to expect—milk from the cow.

1876. However poor the quality may be?—That is all they ask for—sweet milk from the cow. But I do not mean you to assume for a minute that that is what I would like the standard to be at. In business we want to buy a good quality of milk, but we want to be absolutely fair to the producers—can they produce it in an average stock.

1877. The Act implicitly says if you cannot produce an average quality of milk you shall show a reason to the Court why you have not been able to do so?—That is so.

1878. That is what the Act says in effect?—That is what the Act says. The standard is presumptive in any case, but it gives the odium of standing in a court of law defending yourself owing to too high a standard.

1879. The Act only implicitly says if you cannot produce an average condition of things—it does not ask for more than that—you shall show to the satisfaction of the magistrate good cause why you cannot do it?—I think I have shown you the average condition of things there.

1880. Pardon me, a limit of 2·75 is not an average condition of things?—I think I have shown that 20 per cent. in one case is under 3, and nearly 33 per cent. in the other case is under 3 at certain parts of the year; would you not consider that a fair average?

1881. It is not an average?—What is it?

1882. It is not an average; it only shows there are thirty-three out of 100?—I would add that these thirty-three cows——

1883. That is not an average: where are the sixty-seven?—The sixty-seven are there; you are getting an average.

1884. The sixty-seven are above that—considerably above that. Take your thirty-three cows: they produced an average amount of cream of 3·49?—Yes.

1885. They gave an average amount of solids not fat of 9·30?—Yes.

1886. The total amount of solid matter which they gave on the average is 12·82?—That is so; but these were taken in the afternoon, you must understand—just given in lots; and the morning milk may be considerably below that—in fact is considerably below that.

1887. We have evidence as to the range of variation between morning's and evening's milk: it is not sufficient in the amount of fat to depreciate it very considerably; it does depreciate it, I admit, but it does not lower it below 3 per cent. in the amount of fat?—That is not Professor Carroll's experience.

1888. We shall be glad to hear his evidence, but, as far as our testimony at present goes, the range of variation is not quite so great as to make a very sensible difference?—I suppose you are conversant with Professor Carroll's experiments on the morning and evening milk?

1889. I do not know the exact figures, but it is not necessary to produce evidence to know that there is this variation between morning and evening?—I thought you denied there was any appreciable difference.

1890. I never said anything of the kind; I said it is not so wide as to lower the amount of fat from 3·49 to below 3—namely, to 2·75?—Why would you not bring it down to that?

1891. I put it this way: Do you mean to tell me now that these thirty-three cows, which, on the average, gave 3·49 per cent. of fat in the afternoon, would give 2·75 on the average in the morning?—That is quite possible. According to Professor Carroll, he says eight cows were selected, and the following was the mean composition of the milk taken from the eight cows for the whole six days:—Morning, total solids 12·08, non-fatty solids 9·18, fat 2·9; evening, total solids 13·78, non-fatty solids 8·9, fat 4·88. That is a very wide discrepancy.

1892. But in no case is it so low as 2·75?—It is.

1893. I mean on the average?—In the morning the fat averaged 2·9, in the evening it was 4·88.

1894. 2·9 is not as low as 2·75?—That is so, but in fixing 2·75 you understand that that milk at 2·9 is quite possible to be at 2·75 by the afternoon after having been all day standing in a can.

1895. We are not dealing with that now?—We are dealing with the practical outcome.

1896. We are not dealing with that immediately; let us take one thing at a time; I am taking the average composition of the milk?—I am taking the practical sale of the milk.

1897. I should like to get from you, as a former president of the association, what you on the basis of your experience would recommend to this Committee as the standard which should be adopted if any standard at all is adopted?—I should say 2·75 of fat is a fair and reasonable demand.

1898. What about the total solids?—The matter of the non-fatty solids is more important than the total solids, because there is an opinion evidently among some analysts that should the non-fatty solids come below 8·50 the milk is watered. In some of these samples you will find the fat pretty high and the non-fatty solids come under 8·50 considerably, and yet I am morally certain they are not watered.

1899. These are individual cows, are they?—No, they are not individual cows.

1900. Are they herds?—They are individual farmers' milk, and represent full supplies. They are very rich in fat and poor in non-fatty solids.

1901. What should be the standard of non-fatty solids to be associated with 2·75 of fat?—I am not prepared as to the non-fatty solids, only I can show you in that instance it is certainly wrong to make it hard and fast that 8·5 should be the limit where water should be discriminated.

1902. We as practical men do deal with things in a practical way; the reference to us is to suggest to the Board of Agriculture that certain standards should be fixed—whether the Board of Agriculture will fix those standards is another matter. You gave us no help beyond the fat?—The only help I can give is to show you that perfectly honest milk is produced rich in fat, and below the solids not fat of the present limit.

1903. That is no information to this Committee?—It is information.

1904. Pardon me, we know that individual cows or even that small collections of certain breeds of cows will do that; that does not help us to recommend to the Board of Agriculture what the standard should be?—Do you say 8·50—that under 8·50 it would have water in it irrespective of fat?

1905. I do not say anything; I want you to say?—I am not a practical chemist in that matter; but I am giving you instances where I show you that an injustice would be done to a man to say there was water in it when it was shown to be a very rich sample of milk otherwise than in regard to the solids not fat.

1906. May I again remind you that there is no actual injustice being done; we call that man's attention in a formal way, under the procedure of the Act, to the fact that his sample of milk is below a certain average condition of things; and it is for him to satisfy a magistrate that nothing has been done to the milk, and that it is the genuine produce of the cow?—Would you think of taking a man before a magistrate whose milk was 8·34 in non-fatty solids and 4·4 in fat?

1907. I may or may not, I express no opinion on that point. Would you think of doing so, or would you recommend me to do so; I do not express any opinion about that?—I say that is a very rich sample of milk from the practical side of the question, and that it is of more value than a milk with less fat and more total solids would be.

1908. That may or may not be the case, that is a matter of opinion. We are entitled to a certain amount of nutriment of all kinds in the milk, are we not?—Certainly.

1909. Then I may gather that you, in your capacity here, are not prepared to make a further recommendation to the Committee?—Not in the matter of solids not fat, because if analysts are not prepared themselves to adopt a fixed limit, it is difficult for a practical man to come in.

1910. That, of course, is again a matter of opinion; analysts are prepared, and a very large proportion have acted upon it, otherwise how have they brought these matters into court if they are not prepared?—I have shown you that they are not very regular in their methods nor very clear.

1911. (*Mr. Cowan.*) With regard to the analysis which you have brought before us, you show a pretty high average standard, and yet you seem to suggest that 3 per cent. would be too high a standard for butter fat, and recommend rather that it should be 2·75?—Yes, that was because of these six series of samples, which are exceptionally good samples for any average number of supplies, one of them was a black sheep, showing 3·08. The sale of that milk in a perfectly honest trader's hands would be dangerous, in so far as supposing the milk was to get to the bottom of his pan in the forenoon or afternoon of the day, the milk would not then show 3·08.

1912. The trader may be able to protect himself; but in the case of the producer, do you think there is really now any difficulty in a well-fed herd giving an analysis over the whole herd of 3 per cent.?—I should hope there was not. I do not want anything else; but I have shown that there may be exceptions.

1913. A well-fed herd—were these thoroughly well fed?—They were all well fed.

1914. Do you think it is right that the consumer—I would leave out the producer possibly; I think he will be able to protect himself—should get milk at 2·75?—I do not think there is very much actually sold—I am speaking of Glasgow—at 2·75 of fat.

1915. Do you think it is all above it?—Certainly, speaking for Glasgow, I would say it is all above it, and the average is very much above it, but there are exceptions, and it is quite possible that the exceptions might form a criminal charge against a man.

1916. That could be provided for very likely?—In what way?

1917. It would not be fair to the trader if, say, the last quart of milk in a ten-gallon can was taken by the inspector, and the man was summoned before a magistrate on that account; that could be protected against; besides the trader surely could protect himself by a contract with the producers of it; as a trader you can easily protect yourself?—Not as to the odium first of a court of law. We might first appear and prove that it has been a second party; but the odium still rests of being charged with a criminal charge, and being brought before the bar to prove that it was a third party.

1918. I think you could protect yourself thoroughly by contract; you could just hand over the contract and say it had not been interfered with by you, and then the producer must be summoned, not the trader or the retailer?—Yes, but we have to show cause why he should be summoned, and a fair sample taken of his milk, and a day set apart by the court; and that very day that it was taken it might not be the same as the day it was taken in the shop.

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1919. (*Mr. Barham.*) I think you are secretary and manager of the largest dairy company and dairy farm in Glasgow?—Not quite the largest.

1920. Anyhow, it is a very important company?—We have a very fair share of patronage.

1921. You speak with modesty; but anyhow, you endeavour to purchase the milk as good as you possibly can, and you never add water to it or take cream from it?—Certainly not.

1922. And you have no desire to get a low standard fixed in order that you may increase the profits of your company?—No, certainly not.

1923. From your knowledge of the dairy trade of Glasgow, whom you represent, they have not sent you here to give evidence for that purpose?—No.

1924. And you would not appear if they wished you to, I presume?—Certainly not.

1925. It has been suggested here that the difference in butter fat between the a.m. milking and the p.m. milking is very slight; we have had it in evidence before us that it ranges from a half to 1 per cent., but you put in Professor Carroll's figures, which show that it ranges up to as high as 1·4 per cent., did you tell us?—Yes, something like that.

1926. Professor Carroll is not a dealer in milk or one who desires to depreciate it; he is, in fact, in charge of the Government farm in Ireland at Glasnevin, called the Albert Farm, I believe?—Yes, I believe so; he is at Glasnevin.

1927. So that the range in fat between the morning's and the evening's milk varies from about a half per cent. up to, according to Professor Carroll, 1·4 per cent.?—Yes, according to Professor Carroll.

1928. It has been suggested to you that it would be rather a pleasant experience than otherwise for you to go into a police court at Glasgow, and prove to the satisfaction of the magistrate that the milk was sold in the same condition as it came from the cows, and that you would be exonerated, supposing you could prove that. Would it be necessary in the first instance to bring the man that milked the cows, the man that cooled the milk, the man who drove it to the station, the porters that received it, the guard that brought it to your town, supposing he kept it under his supervision the whole time, and can prove the porters that received it at the town station, your man that received it at that station, the foreman whom they handed it over to, and so on, would you consider that would be necessary to prove the purity of the milk?—The system of proving these sorts of cases in Glasgow has been that when there is any suspicion that a farmer has been tampering with milk, and a plea of that kind has been put in court a sample is taken at the station of delivery by the sanitary authority of the district. We have power in Glasgow to ask now to take these samples at any time that we are suspicious, and should they both tally, then one is liberated from the charge after standing the odium of the court and the other man is put in the dock.

1929. It would then be his turn to prove that the milk reached its destination in the same condition in which those cows gave it?—That is so; the producer would have to do that then.

1930. That would not be a light thing for the producer to do; it would not be an easy matter, would it?—It would not be an easy matter.

1931. It would be an expensive thing, in all probability?—It would be a very difficult matter indeed.

1932. And when he had succeeded in doing it, it would then only prove that his cows gave poor milk?—Yes.

1933. You speak about the cows that have been tested, and you say that 20 per cent. of them gave under 3 per cent. of butter fat; those cows were not under what are termed abnormal conditions, I suppose?—No, they were all in normal condition.

1934. The cows were in good health and good condition, and were properly and sufficiently fed?—Yes, they were very representative stocks on dairy farms round Glasgow.

1935. It has been suggested that it is the duty of every farmer to mix the milk of the whole of his herd together, but as a matter of fact, in practice that is very seldom adopted, and the milk of six or seven, or eight or ten cows, whatever may be necessary for filling the churn, is milked and cooled, and the churn is sent away in that condition?—That is so.

1936. You probably receive from some of your senders four or five churns of milk—perhaps more than that—from the same sender, do you?—Yes, quite.

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1937. Is it your practice to carefully avoid mixing those milks?—Our practice with any milk that comes into the depôt is to put it all together, but there is another practice of the trade—it has to be delivered on the way from the station—which it is difficult to overcome. There is wholesale trading at several railway stations in the city—that is, a dairyman may get a churn of sweet milk sold to him at the station, it may be a poor one, and it may be a rich one, but it is not all mixed.

1938. You mean the wholesale firms supply the milk *en route* from the stations, and they cannot possibly mix five or six churns together in their van, but they sell each churn on its merits?—That is so.

1939. Perhaps this would not quite come under your experience, but if you have milk from a farm in five or six churns, do you occasionally find that one churn keeps very much better than another?—Coming from the same farm?

1940. Yes.—We do.

1941. Therefore it is desirable, unless you want to bring all the milk down to one low standard of keeping, to sell each churn on its own merits?—Looking from that point of view, one bad butt would spoil the whole lot were it all mixed.

1942. The cow may have a bad quarter; that is put into one churn, and it injures that churn, but if the whole of the milk is put together the whole of the milk is injured to that extent?—That is so.

1943. We have heard a great deal about averages to-day, and you have put in a list of the averages of the largest buyers of milk in Scotland; was I correct in that?—One of the largest, not just the largest.

1944. They give a bonus acording to the fatty contents of the milk; they pay a premium, I think you said?—They give a bonus if it is up to a certain standard, I believe.

1945. We do not want to assume too many things, but I think we should be safe in assuming that the farmers supplying that factory would send as good a milk as they could reasonably provide, or profitably make?—Yes, that is so.

1946. Then we are told that the milk sold in a town must, from some reason that I cannot understand, be the mixed milk of a given number of cows, say 30 cows, or 20 or 15; but do you know of any Act of Parliament that is to prevent a man selling the milk of four cows?—None.

1947. Are there not a number of holders in Scotland who do not own more than four cows?—Yes, small cow feeders.

1948. There must be a number, I should imagine?—Yes, there are a great number in the villages particularly.

1949. If they had cows giving poor milk—some of these individual cows that we have heard of—then, of course, the milk of the four cows must be poorer than the standard of 3 per cent. in butter fat?—I should imagine so.

1950. Under the new Act I believe the trade so termed as distinct from the producer is protected by a warranty, so that if the milk is sold by them honestly and fairly all the onus of the punishment will fall upon the farmer?—I do not know whom the punishment would fall on; it certainly does exonerate the man who is charged.

1951. Under the old Act there has been a great difficulty in fixing the warranty, as I understand, upon the farmer, and bringing it home to him, but under the new Act, if I am not mistaken, that has been made quite clear, and the onus now will have to be borne by the farmer, whatever district he may be in. That being the case, you in one sense have no reason to come here to desire a low standard, because the industry that you follow is such that it is to your interest to get the highest possible quality of milk that you can get?—That is so.

1952. Therefore you have come here to give evidence, and to suggest 2·75 of fat in the producer's interest more than in the interests of the trade?—That is so.

1953. You have told us with regard to the non-fatty solids that when milk is rich in fat, say that it has 4·5 per cent. of fat, the non-fatty solids, by which, as a rule analysts judge as to whether water has been added to the milk or not—that people would get better value for their money with 4·5 per cent. of fat, and say 8 per cent. of non-fatty solids, than they would if they had 8·50 of non-fatty solids and 3·25 per cent. of fat?—I should imagine it to be a more nourishing food.

1954. You would imagine that they would get better value for their money?—Yes.

1955. Therefore you think that milk with non-fatty solids so low as 8 per cent., supposing the fatty solids were high, should be passed as pure milk?—Yes, consistent with a fair amount of fat.

1956. (*Mr. Murphy.*) Have you any reason for thinking that the cows in Scotland produce milk of a lower quality than those of England generally?—The only statistics I have are those of the Aylesbury Dairy Company, which are very high. I think, as I have already said, they do not form a very fair approximate, because the company are the proprietors of their own stock, and naturally they buy——

1957. (*Mr. Barham.*) No?—I may be wrong, but I have always believed that they were the proprietors. Certainly they are very high, much higher than we can get in Scotland on the average.

1958. (*Mr. Murphy.*) Would you suggest that a standard based upon the experience of English milk would be applicable to Scotland?—No, I rather think not. Shorthorns, on the average, must be better in fat. I suppose the various exhibitors at the London Dairy Show are not accepted as an ordinary sample at all, certainly the Shorthorns show badly there, but it must be kept in mind that there is generally more in the class of the Shorthorn than of the Ayrshire. I should say it would be unfair to fix a standard for one locality where there are so many mixed breeds, as against another, where there is simply the Ayrshire breed, without giving due consideration to the evidence of the produce of Ayrshire cows.

1959. Is it the breed of the cow or the method of feeding the cow that underlies the question?—The question of quality certainly lies pretty much in the breed, but as will be clearly shown by experts, good quality producing cows send down that quality to their progeny, and those who produce bad quality can be reproduced again in their progeny—that is beyond a doubt. Over against that there is undoubtedly the fact that brewers' grains in the district round Glasgow do affect the quality very much in dredging cows to the very utmost of their milking power.

1960. I understand—beyond any power of the owner of the cow—you think it would be unfair to judge Scotch milk by the standards of English milk?—I think it would be to judge the one without fair evidence of the other.

1961. You referred just now to the analyses of Professor Carroll, are they entirely based upon the milk of Scotch cows?—I do not know what breed; it was at Dublin; it would be a cross of the Shorthorn and Kerry, or something of that sort.

1962. (*Major Craigie.*) Have you come here as representing the Glasgow Dairymen's Association?—No, I have not; the dairy trade rather I represent.

1963. Then expressing your own view and not that of any association, do the Committee understand you to advocate a standard of 2·75?—I think that fair and reasonable.

1964. And along with that standard you would be content to take a low proportion of solids?—Consistent with a fair proportion of fat; it is not the total solids, but the solids not fat, I am referring to.

1965. I beg your pardon, would you be content to take a low proportion of solids not fat, along with the 2·75?—No, certainly not.

1966. May I ask you one other question with reference to these tables you have put in; is the practice usual in Scotland—it used to be usual—of taking 3 milkings in the day?—It is not very common; it is practised in some localities, but it is a very small practice.

1967. So small that it would not affect the evidence you have given about the difference between the a.m. and p.m. milking, which it might modify to some extent?—No, it does not affect any of these samples.

1968. (*Chairman.*) You come before us to-day, I understand, as approaching the subject from the point of view of a distributor of milk?—Yes.

1969. Not of the producer?—No.

1970. And you say as a distributor of milk you think the standard should be as low as 2·75?—I think that a fair and reasonable limit.

1971. Because you are afraid of running the risk of being summoned to a police-court for selling milk which at present is higher than 2·75?—That is so.

1972. At present your standard in Glasgow is what is known as the Somerset House standard—3 per cent.?—They have been acting on 2·75, but I understand Somerset House have been a law unto themselves recently,

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and have instructed the authorities to raise it to 3 per cent. I do not know why it should have been done before this Committee's decision.

1973. Taking the standard now, the 3 per cent., do you fear prosecution under that standard?—We do.

1974. Have you had any?—No, as a company we have had none; and as a distributor I have had none; but in the case of that instance I have given you of one bad lot in six—3·08—I am perfectly certain that any day in the week I would be in the dock for that milk were a sample taken from the bottom of the counter pan.

1975. We can understand that there are samples and samples in a case where you would have no difficulty in proving to the satisfaction of the court that they are genuine; but on the samples taken, say, at the bottom of a ten-gallon churn, nobody in their senses would convict you?—Convictions have taken place in Glasgow where it has been shown to be the practice of the inspectors there not to take samples in the early morning, say, when the great mass of people are being supplied; they watch for a dull time of the day, and generally the latter part of the day, when the counter pan is very near the bottom—I mean the little counter pans where 5 or 6 gallons possibly are on the counter; they are dipping from that from time to time, and even though the attendant exercises the very best care, the milk at the bottom is not the very same in fat as that at the beginning of the counter pan. It is in that instance, I fear, the prosecution will be unduly hard, and certainly would come in in the case of the sample of 3·08.

1976. Still, that could be easily explained to the magistrate, and I suppose you could, when the analyst appeared against you as it were, show that your statement is correct?—Yes, but in Scotland the sheriff says and holds quite reasonably that the purchaser who comes in the afternoon is entitled to get as rich milk as the customer who comes in the morning, and that if there is any loss in fat through skimming the milk in the act of selling throughout the day, you must put cream in it—that is, from the sheriff's point of view; of course, it is not practicable.

1977. But in point of fact, you have had no prosecutions on the standard, which is now 3 per cent.?—The trade have had prosecutions, but not I as an individual; I have not been endangered in any way further than I do not know the day I might be endangered.

1978. I suppose you can make yourself personally safe by entering into the contracts we hear spoken of as being the custom in, at all events, this part of England; if you feared any prosecution you could easily stipulate with the people who supply you not to send you on any more milk in which there was not a certain volume of fat?—We might be up to a certain standard, but there is a difficulty in knowing when you get the certain standard. We have no implements at hand just now that are ready for any ordinary practical dairyman that can show you when water is in a sample which may be fair in fat. I have had a return of 3·3 and 3·4 of fat with something like 11 per cent. of water. You can easily see that that can be sold to the public before we know that anything is wrong. The same would apply in the matter of fat. That 3·08 might come in to a man who had guaranteed to my company to send 3·3; we cannot rely on the necessity of the distributor analysing or testing every drop of milk that came in.

1979. I do not see why you should have any more difficulty in Glasgow than the Aylesbury Dairy Company and the other companies in London have in keeping up the standard as high as they can reach?—They have a different stock of cows to begin with, and it is not everybody that has the staff of the Aylesbury Dairy Company to deal with supplies when they do come in; it is a huge concern.

1980. What sort of quantity of milk do you deal with?—500 gallons a day, or something like that; all retail, of course—we have no wholesale business.

1981. (*Professor Thorpe.*) How many households do you supply roughly?—I could not say—pretty well on a thousand I should say, and they are west-end houses; it is a purely west-end trade. That is merely speaking from memory; I could not give you the exact number.

1982. That is a sufficient approximation, if you think that is reasonably accurate?—Yes.

Mr. Hugh Kennedy, called; and Examined.

Mr. H. Kennedy.

1983. (*Chairman.*) You are the president of the Glasgow Dairymen's Association—that is, you have taken the place of Mr. Stirling?—Yes.

1984. And you are proprietor of the City Dairy in Glasgow?—Yes.

1985. (*Professor Thorpe.*) How does the City Dairy compare in point of turn-over with the Glasgow Dairy Company?—I reckon it to be one of the largest wholesale dairies individually in the city. My turn-over is somewhere averaging between 1,000 and 2,000 gallons a day. I am wholesale chiefly, but I have several retail shops as well. I supply a great many traders with milk, as well as dozens of shops, or hundreds of shops, I cannot say exactly how many, all over the city—east, west, north, and south. Those are retail dairy keepers more than wholesale dairy keepers.

1986. Can you give the Committee any idea as to the number of larger firms concerned in the distribution of milk in Glasgow?—Larger than I am?

1987. I understand you are one of the largest?—I reckon myself to be so.

1988. Can you tell us generally who are the others, or how many of them; I do not want particularly their names?—I have a brother in the trade equally large; he is agent for the United Creameries, and in that way his turn-over is larger in separated skim, and all that sort of thing, than mine is, simply because of his being the agent for Scotland for the United Creameries. Then there is another company, Harvey and Co., of Hundred Acre Hill, who used to keep at one time something like a thousand cows; they have now done away with that cow feeding, but are also very large dealers in milk. There are others of the name of Hamilton, who are also large dealers in milk. Then there is Brand, who is now deceased. He was also one of the very largest retailers of milk—that is, drawing on the streets in pennyworths, and two pennyworths, and so on. These are a few of the largest.

1989. What I really want to get at is this, is the purveying of milk in Glasgow practically confined to some six, or eight, or ten firms?—The milk of Glasgow! I should think there would be some hundreds connected with the trade.

1990. In what way?—They would be suppliers of milk to the city—middlemen who have horses of their own.

1991. Who trade directly with the farmers?—Who trade between the farmer and the public.

1992. That is to say, they are on a smaller scale, but very much in the same relation to the city that you are?—That is so.

1993. Now, I understand you to concur with Mr. Stirling in suggesting that the standard should not be higher than 2·75 of fat?—That is so.

1994. How have you arrived at that standard?—By prosecutions, which have been very frequent from time to time. I have been asked as a witness at some of those cases where the inspectors have invariably come in the forenoon of the day, after the public have been supplied with their morning's supply, consequently leaving that which is left in the dish to be of a poorer quality than what the early purchasers receive. In nearly every instance do the inspectors have the milk in the forenoon of the day—no matter whether there is only one quart in the dish, one gallon in the dish, or two gallons, they pay for a sample therefrom; if found deficit in fat the case is brought up in court, the person is fined, the sheriff says he has no alternative, the chemist is brought to prove that the analyses are correct if it is found below 2·75. I have known of a case even of 2·6 where a very poor person, whom I have no doubt in good faith sold the milk as she received it, was convicted and fined to the extent of £5, and other expenses. We thought it a very hard case, so much so that the Dairy Association agreed, I think, to pay the expenses, or to defend that case, but we lost it simply because it was slightly below 2·75, although it was proven in court that the milk was supplied when there was only about one gallon in the bottom of the dish.

1995. Then I gather from what you have stated that your idea of a limit of 2·75 had regard rather to the injudiciousness of the sampling than to the quality of the milk?—I do not quite understand.

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1996. You say that the samples are taken in a way which is manifestly unfair; I gather that is your opinion?—That is one plea. I desire to defend the trade, or others, and I think that the analyses, or rather the standard which we have always understood to be, Somerset House standard to be, 2·75.

1997. But the point is you see from what you have told us, it is because inspectors are in the habit of injudiciously taking samples that this particular limit of 2·75 has been arrived at; that was the argument that you put forward why it should be 2·75?—Not the argument exactly. I have analyses here which would prove that many samples of pure, genuine milk, all taken from supplies contracted by me, and warranted genuine by the farmer, and I may say that I have the produce of upwards of 50 dairy farms; individually I have that, and the range may be from 10 cows up to 150, it may be 200 cows that some farmers——

1998. Perhaps you would state then what are the other arguments; you have given us one argument, namely, the injudicious sampling; what are the real arguments that cause you to believe that 2·75 is a fair and reasonable limit for fat?—Because Glasgow is altogether supplied, or nearly entirely supplied, by the product of Ayrshire cows, which has been proven from time to time to be of a much lower percentage of fat than the Guernsey, the Jersey, and your South of England cows.

1999. I suppose Dutch cows are not to be found in Ayrshire, are they?—Not that I am aware of.

2000. You are aware that there is a considerable sprinkling of Dutch cows in the South of England?—I was not aware of it.

2001. Do you know that Dutch cows are still to be met with in relatively large numbers in Essex?—I was not aware of it.

2002. If you were aware of it, or made aware of it, do you not think that would affect the quality of the milk supply in the South of England?—It might. I suppose the Dutch cow is something like the Ayrshire cow as to quality, but I suppose the percentage must be very small.

2003. But you have no accurate knowledge of that?—That there are Dutch cows?

2004. You are not aware apparently that there are?—No, I was not aware.

2005. Therefore you are not able to say what the relative proportion would be?—No, I am not. I cannot speak for England. I am here to speak for Scotland and the supply coming into Glasgow.

2006. The standard for separated milk practically arises I suppose, from the circumstance that cases have been fought out in the court as to whether the customer is prejudiced when he asks for skimmed milk by getting separated milk; is that what you mean?—Would you kindly state that again?

2007. You are aware that prosecutions have taken place based upon the fact that the purchaser has asked for skimmed milk, and he has been served with separated milk, and because if he has not got that amount of fat which is supposed to be associated with what we ordinarily term skimmed milk he is prejudiced; are you aware that prosecutions have been based upon that?—I am only aware of one case in Scotland, in Paisley. It was fought out. We had the best analysts in Scotland. We had an analyst from Dundee, Mr. Drinkwater, from Edinburgh, and we had our Glasgow analyst there also. After giving their evidence, which went to show that separated skimmed milk was a more genuine article of milk in every shape and form for the consumption of children or invalids, that it was much safer and better, healthier, fresher, newer, freer from dirt, and all that sort of thing, that it was Pasteurised, and, therefore, that it was a better article of milk than hand-skimmed milk, the case was dismissed.

2008. That perhaps was not the point that was raised in the action?—It was not of the nature and quality of skimmed milk; it was threshed out. There was no standard for skimmed milk, and there could be no standard for skimmed milk.

2009. Did not the case turn upon the fact that the person purchasing this milk did not get that amount of fat which was associated with ordinary skimmed milk?—It was a sanitary inspector who purchased; there was no complaint from private individuals about the nature and quality of the milk.

2010. What was the point which was before the magistrate?—That separated skimmed milk was not skimmed milk at all.

2011. Why?—Simply because it was considered a pure quality of skimmed milk with the cream abstracted from the milk.

2012. There is a common ordinary distinction between skimmed milk and separated milk?—I may say that in preparing my synopsis of evidence I was not sure whether skimmed milk would be brought up or not; but I came here prepared to talk of the matter were it so.

2013. (*Chairman.*) It appears that your definition of skim milk is not the same as that of Professor Thorpe, who says that skimmed milk is apparently the stage between the ordinary sweet milk of commerce and the separated milk?—I never was aware of the fact.

2014. Do you sell separated milk under any particular sort of guarantee?—That it is perfectly free from water; that is the safest way. I think we get pure skimmed milk.

2015. If the inspector pounces down upon anybody selling separated milk as skimmed milk, and it is shown to contain a large quantity of water, is the seller liable to conviction?—Yes, if water is found.

2016. Any water?—Any water below what is reckoned to be natural.

2017. (*Professor Thorpe.*) You mean added water?—Added water, whether it be found in skim milk or sweet milk; my argument put in a nutshell is this, I say from experience, and I have had experience for the last twenty-four years, I cannot see how it is possible to fix a standard for skimmed or separated milk, skimmed milk being the balance after the extraction of all the cream, whether the methods for such extraction be done by the hand or mechanical power. We can also prove that you can get hand-skimmed milk poorer or as poor as it is done by mechanical power. I can give you here three cases if you wish where it is hand-skimmed milk, where the percentage of fat is so low as 0·40, and in one case of separated milk 0·15.

2018. (*Chairman.*) Who took those analyses?—Dr. Aikman, Glasgow.

2019. Is he a public analyst?—He is a public analyst. I do not see how it is possible to fix a standard, because you would never have it twice or three times of the same quality. Sometimes we get it separated better than hand-skimmed milk, simply because the man in attendance is not very careful in whipping off all the cream.

2020. (*Professor Thorpe.*) Of course, the question is very much of the same order as that relating to the milk itself. You come here and say milk is variable—of, course, we are aware of that—and you also say skimmed milk is variable in regard to the amount of fat; still, just as in the one case we think the consumer has the right to expect a certain minimum of fat and a certain minimum of solids not fat in his whole milk, so it may be argued he has a right to expect certain quantities in skimmed milk?—Do you not think—putting you in the place of a commercial man—you would try to extract all the cream that was possible out of the milk?

2021. (*Chairman.*) I should say the purchaser has not a right to expect any cream, and he is very lucky if he gets any?—Yes, that is it.

2022. (*Professor Thorpe.*) We have also heard from Mr. Stirling that the cream as sold in Glasgow is a business peculiar to itself, inasmuch as you have something which we in England do not ordinarily regard as cream, that is to say, a fluid which contains from 9 to 13 per cent. of fat, which is somewhat intermediate with what we should regard as ordinary cream and whole milk; is that so?—That is so.

2023. Therefore, you think the circumstances of Glasgow in this respect being peculiar, it is impossible to devise a standard for cream—is that so?—Either that or making it a very low standard.

2024. Has that particular kind of cream any specific name?—It is always called cream, as far as I can remember, and I have been speaking to older men than I, and we cannot find out how far it goes back.

2025. You call it cream no doubt in vending it, but what do you call it amongst yourselves?—Amongst ourselves we do call it cream. We have cream ranging from 8 to 9 per cent. up to 50 or 54 per cent. of butter fat.

2026. How do you amongst yourselves distinguish between these various grades of cream? What are the trade names that you give to them?—The poorer cream is always called "cream," the richer cream is called "double cream," "working cream," or "switching cream" we call it in some cases.

2027. Are there only two grades of cream?—There are various grades.

2028. I want, if I can, to get their names?—At the present time I am supplying a special quality of cream, averaging about 25 per cent., or as near by as I can arrive at that.

2029. Let us get it clearly down; there is first cream?—Perhaps I had better give you an explanation how we arrive at it.

2030. The first is cream?—Yes.

2031. Which may contain from 9 to 13 per cent.?—9 to 12 you had better say. You want to know how we get that cream?

2032. No, I do not ask for that. I think I can imagine how you get that. Now what is the second quality of cream called—you say there are five or six?—I say we can give any quality ranging from 20 pence a gallon up to 8s. a gallon; we sell it according to the price.

2033. Not at present if you please; I want the qualities, and how you designate them. I have got to know what cream is; it may contain from 9 to 12 per cent. of fat. What is the next quality?—It may be a little higher, just as if we want it lifted for a certain purpose. If we want thicker cream for any special marriages, or working cream, or double cream, we charge them accordingly, and supply them with cream accordingly.

2034. I have not put the question of price; you told me there are four or five grades; are those well recognised grades amongst you as a trade?—The lower grade is the grade that is universally used, the only other grades are made to special orders; when it goes above 12 per cent. it is to meet special orders, and they pay a better price. Every dairy supplies that poorer cream, and it is only a few dairies in better localities who supply the richer cream.

2035. The richer cream I gather may vary from 15 per cent. to 50 per cent. of butter fat?—That is so.

2036. Is that all sold at the same price?—No.

2037. Then how is it graded; do you designate everything above 15 per cent. as double cream?—Cream which will be above 15 per cent of fat may bring 2d. per gill.

2038. What is it known as?—I suppose the Dairy Company themselves are about the only ones that do supply that quality of cream. Mr. Stirling represents the Glasgow Dairy Company, which supplies in the west end of Glasgow many of the better class of people, and they do not begrudge giving a better price.

2039. What is it known as; that is what I am trying to drive at?—As cream; Mr. Stirling might answer that question himself. I think that his is the only company which supplies it. (*To Mr. Stirling.*) Perhaps you would kindly tell us what you call that cream which contains 15 per cent. of fat?—(*Mr. Stirling.*) Just cream. It is a matter of quality, as is explained to you, we give a quality of 15 to 25 per cent. or so, which is sold at exactly double the price of these other qualities. It goes under the name of cream. Anything from 30 to 50 goes under the name of double cream or switching cream. There are practically only the two names for the cream—cream and double cream. That is sold according to your customer.

2040. (*Professor Thorpe.*) (*To the Witness.*) Now I think I have got at it; perhaps you will correct me if I am wrong. The cream containing from 9 to 12 per cent. of butter fat we may regard provisionally as a cream which finds its customers among what we may call the east end—the poorer quality?—No, not the east end, all over the city, in the west as well. But Mr. Stirling has introduced as a speciality for particular customers of theirs a better quality of cream; this is an introduction of their own.

2041. Now I will get it in another way. Mr. Stirling purveys a cream which may contain from 15 to 25 per cent. of butter fat, for which he naturally charges a higher price?—Double the price.

2042. Double the price of that from 9 to 12?—Yes.

2043. That is also called cream, but it is a better quality of cream, and commands a relatively higher price. Then there is another quality of cream, which is known as double cream, and which contains from 30 to 50 per cent. of butter fat—that is known as double cream?—(*Mr. Stirling.*) In some cases, as switching cream.

2044. Switching cream, or whipping cream, or double cream?—Yes.

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2045. That, of course, again commands a higher price?—(*Mr. Kennedy.*) Yes, it is 8s. a gallon.

2046. Practically, therefore, there are only two grades of cream really?—Practically there are; the other is a speciality.

2047. The qualities of which are a little bit different; there is one from 9 to 12 per cent., and there is another from 15 to 25 per cent., both of which are called cream; and then there is a high class cream, you may call it, for the sake of defining it, which is known as double cream, which contains from 30 to 50 per cent.?—That is so. I may also say that this poor cream is used in almost every household by all families, from the richest, I say, to the poorest. Even from the Lord Provost, if you like, down to the poorest citizen of Glasgow; they must have their supply of cream for tea purposes, their halfpennyworth or pennyworth, or it may be six pennyworth of this cream. We use it for desserts and puddings much more so than you do in England; in fact we never think of putting a cup of tea down to anyone without putting a little of this cream down beside it. The same applies to all desserts and puddings, therefore I say it would be a very great hardship if there was a standard fixed that might be beyond the poorer working classes being able to pay for this quality of cream, or the privilege they have been accustomed to from all time.

2048. Is this a custom peculiar to Glasgow?—It is so.

2049. It does not obtain in the west of Scotland generally?—I think not; it is peculiar to Glasgow.

2050. Does it obtain in Edinburgh?—I understand it does—I was told so, but not so much. You will get a better quality of cream there; you will have to pay a little more for it, but I understand you will just get as poor as you get in Glasgow.

2051. You deprecate for these reasons the fixing of a standard of fat for cream?—Yes, from 9 to 13, I say, or 9 to 12.

2052. I mean you advise that no limit should be fixed in the case of cream?—As an association I think it meets with their desire that no standard be fixed for cream—that cream be sold according to demand, use, and wont—according to the price paid.

2053. You say the price rises according to the quality?—That is so.

2054. And the purchaser can always be protected by seeing that the quality or proportion of fat is equal to the price paid?—That is so, if they are so inclined.

2055. How is he to protect himself?—I suppose his palate is very good. In Glasgow the public, we find, to be very good judges in most cases.

2056. Do you think a man can protect himself between 15 and 25 per cent.?—I say it is only the special cases; there are very small percentages of cream sold at that quality—where, as I say there are hundreds and thousands of gallons of the poorer cream there is not one gallon of that thicker cream sold in Glasgow.

2057. The great bulk is 9 to 12 per cent. of fat?—That is so; every dairy shop in Glasgow has that 9 to 12 per cent. cream.

2058. It is a very poor cream?—We get a very poor price for it. The public is getting the benefit.

2059. Have you anything to say in addition to what has been said already on the question of the uniformity of analysis?—I have here the proof of a case which I substantiated the other day. The Board of Agriculture should fix that one method of analysis to be adopted by all chemists acting under the Food and Drugs Act, because of the great dissatisfaction which is caused from time to time at the results of analyses of the same milk by different chemists. In proof thereof, about a month ago, a sample of sweet milk was divided into three portions, with the following results, namely, part 1 was sent to Dundee, with the result of the analysis, showing 2·78 per cent. of fat. Part 2 was sent to Edinburgh, showing 2·2 per cent. of fat; and Part 3 was sent to Glasgow, showing 2·54 per cent. of fat. In court this person would certainly have been fined for having sold milk below 2·75 had not the reference sample been sent to the Dundee analyst. The other day it was clearly proven that this milk was below the nature and standard quality of milk—below the standard of Somerset House—below 2·75, and the judge would have no alternative but to fine this person. In defence of such case the city analyst from Dundee was brought forward. He proved that that milk an analysis showed 2·78. It was a matter between the two chemists, city analysts, both men working

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up to date, having, I suppose, all the latest improvements to get the best results; and the sheriff said he had no alternative but to find the case not proven, simply because the Dundee analyst made the very same portion of milk, which was sealed and sent on to him, of a higher standard than the Glasgow man. Therefore the case was found not proven, and the person got scot free.

2060. Have you got the facts there?—Yes, I have brought the summons which is founded on the analyst's result.

2061. Have you got the various certificates?—Yes. They did not give me the Edinburgh one, but you will find the note on the back there, 2·4 in pencil, of which the lawyer defending the case had the particulars. This is the Dundee report, and that is the Glasgow report. I have not the Edinburgh one. (*Handing in documents.*)

2062. The remark of the Dundee analyst is, "This milk is low in fat, but is genuine"; the analyst in Glasgow returns it as being "Deficient in its natural fat or cream to the extent of 10 per cent. or thereby"; the Edinburgh analysis you have not got, but the Edinburgh analyst obviously would make it still more deficient?—The Edinburgh made it 2·4 per cent. of fat.

2063. (*Chairman.*) A very suspicious sample, I should think?—It was, I admit that. This was really a bad sample of milk.

2064. (*Professor Thorpe.*) As the question of Somerset House has been raised, are you aware that that sample would have been convicted by Somerset House; that we should have agreed with the two analysts and declared that milk to be deficient in fat?—We were not aware that you had raised the standard; it is only a few days ago that we were aware that you had been practising on 3 per cent.

2065. (*Major Craigie.*) With reference to the questions that have been put on the subject of cream, I only want to put a further question as to how that cream, the finer cream, was sold; is that sold in ordinary cans, or is it placed in bottles?—The dear cream—the expensive cream?

2066. Yes?—Just in the ordinary way; it is ordered in gills.

2067. That is not in any case analogous to the clotted cream, imported cream that is sold in bottles?—We have from the creameries the same quality of cream put into little jars.

2068. That is what I mean?—We do not call it clotted cream, because we do not work on that principle in Glasgow; it is cream taken off by the separator.

2069. Is the cream that is sold in those jars about the price of the highest cream that you have mentioned?—Yes, they show about 50 per cent. of fat.

2070. Do you know, as a matter of fact, whether there is any large sale of cream imported in jars into Glasgow?—Yes, and some of your English cream comes there from the South of England.

2071. From Devonshire?—Yes, from Devonshire, and it is sold in little jars.

2072. Is there any Swedish cream sold?—I am not aware.

2073. Have you had any cases where the composition of this cream has been challenged and questions have been raised as to the addition of other substances?—Such as preservatives?

2074. No, I do not refer to preservatives?—I cannot say; we had a case brought before us in Glasgow, where poor cream has been gone into.

2075. With reference to another question that has been put as to the mode of sampling on which you founded your objection to a high standard, that is by the taking of samples late in the day in the different shops, the sampling is carried out to some extent, is it not, in Glasgow at the railway stations on the arrival of the milk very early in the morning?—A great deal of our milk is driven in by carts. We are quite adjacent and convenient to the dairy districts. Some of our farmers drive 10 to 12 miles—all the way. In the country men get up early and drive in their milk, and we have it also coming in at the various stations; I have it coming from as far as Galloway and down that way, and all parts of Ayrshire.

2076. How far from the north of Glasgow do you get milk—from what counties?—Down Oban way.

2077. Do you get it from Stirlingshire, Dumbartonshire, and Perthshire?—I get from Perthshire some milk, just between Oban and Glasgow beyond Callander—Lochhearnhead.

2078. Would you say that the milk that comes from those stations is mainly composed of the produce of Ayrshire cows?—I have only a very small supply from there, and I find it a very good quality of milk. He only sends it to me after the butter season stops.

2079. Only for a part of the year?—Only for two or three months in the winter.

2080. (*Dr. Voelcker.*) When you speak of the present standard, you mean what you were led to believe was the standard—that is all?—Yes.

2081. Then you spoke of the quality of the milk of Ayrshire cows, and gave certain figures: are those the result of merely single cows or of herds?—Herds in all cases. I have analyses here of some 30 herds, or nearly so. Some of them show as low as 3·30. We have one case which is doubtful, 2·50, another case 3·10, another 2·70, another 2·90, another 3·20. These are farmers coming into myself individually.

2082. The milk is sent in by farmers to you?—Yes, individually. I may say that I am very particular in making my arrangement. I have a warranty coming every day with the supply that the milk is warranted genuine as from the cow.

2083. What control do you exercise over the quality of the milk that the farmers send you in; what steps do you take?—If we find it below the standard do you mean?

2084. What steps do you take to secure yourself that the farmer has sent in to you a good quality of milk?—Just by signing his name to a bargain form that he warrants the milk genuine and pure, and the whole product of the stock of cows.

2085. What steps do you take from time to time to ascertain whether it is genuine and pure?—Every now and then sending it to the city analysts.

2086. What standard do you or does he fix for determining whether it is up to the mark?—We have known no other standard than 2·75 for some years back. We always understood that to be Somerset House standard, and, of course, if it comes below that we write up, and look into the matter.

2087. You receive everything above 2·75?—Yes, I may say just the other day I took a sample of a farmer's milk, I put the whole of his supply into one tank dish and took a sample therefrom, and sent it for analysis. I was not satisfied with that analysis of the milk as it was very low. The next day I took a sample of the same man's milk. He was not aware that I was taking it. I found a very different result. The previous day possibly the farmer was hurried in putting his milk into his milk despatch butts; the cows may have been excited, I do not know, but the supply came in to me warranted genuine, and in good faith I would have sold that milk as genuine, and the party who received it from me had implicit confidence that they were dealing with an honest man, and indeed would sell the article as genuine milk; but had a sanitary inspector come in and found that same milk which I believed to be genuine—I have no doubt the farmer sent it all honestly as he considered—had it been purchased and sent for analysis the innocent party or the third party would have been fined.

2088. (*Chairman.*) You say the milk from this farm on one day was deficient, and the next day from the same farm the milk was good?—From the very same farm.

2089. That did not raise a suspicion in your mind that the man had been tampering with it on the day it was short, or that somebody had been doing so?—Strange to say it was the very first day I had received this man's milk. To all appearance he seemed an honest, upright man. He signed the usual bargain form that he guaranteed or warranted his milk to be genuine. Being his first consignment, I thought "Well, this is a bad beginning." The next day I took a sample of the same man's milk, but I found it a different quality of milk and a better supply of milk; I think the following day it averaged somewhere about 3·5, although it was only 2·50 the previous day coming from the same farm.

2090. (*Dr. Voelcker.*) Then I take it that in spite of these great differences which exist between analysts you do refer to them sometimes?—Surely; we have no other source to go to.

2091. Although they differ?—We are not saying anything against them. You must not take it that Mr

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Stirling and I are finding fault with any analyst; I have no doubt they are all honest and upright men, and that they want to protect the producer and the public as well.

2092. You have introduced a case here where there is a difference of as much as 0·7 per cent. between the analyses?—I will just give you an example of individual farmers' milk, showing the fluctuations in the quality from the month of September on to the month of June.

2093. With a herd?—With herds. I have here examples of individual farmers' milk. Of eight supplies three supplies come under 3 per cent.—that is, out of the eight herds of genuine milk sent into one of the largest creameries in Scotland.

2094. Is that over a year or a month?—I have the returns for 12 months here.

2095. You do not mean to imply that every month each of those three dairies were below 3 per cent.?—This is giving an average; I say that three supplies came under 3 per cent. of fat.

2096. (*Chairman.*) The whole year?—At some part of the year.

2097. Occasionally?—We must look to that you know; it is when the occasional case comes that we get into the box. I would not for what we are all worth that I should be found in the box held up for dishonesty.

2098. (*Dr. Voelcker.*) You admit it is only occasionally that even these Ayrshire cows transgress to the extent of giving below 3 per cent. of fat?—Not only occasionally—in very many instances.

2099. You have nothing to show that it is otherwise than occasionally?—We have here analyses taken in various months of the year.

2100. That table shows that it occasionally falls below?—Not always, but very often, and not only occasionally, I say. I qualify putting it down as occasionally; very often below 3 per cent. I say.

2101. Then you say that you are bound to fix a low standard, because milk may have been standing on the counter, and the last lot may be taken as a sample, and the retailer ought to be protected?—Yes.

2102. You would admit, I suppose, that if you took a low standard which admitted of the last lot of milk being taken as a sample, that it would also allow of another evil, and that would be the watering down of a large quantity of milk to that level, or the removal of the cream?—I do not think so.

2103. You would not be able to prevent it?—Does the water affect the quality of the butter fat so very much?—Some samples of milk that has really been watered are found to be heavy in butter fat. In Glasgow you are fined for water no matter how heavy the milk is in butter fat. Supposing your milk shall have 4·5 per cent. of butter fat, if it was proven that 10 per cent. of that milk had added water, you would suffer the consequence all the same.

2104. If it could be shown that water was added?—Yes.

2105. But assume that you cannot tell the difference between the addition of water to rich milk and a naturally poor milk?—I do not suppose you would tell the difference in any quality of milk if I was adding water individually unless you applied the same to analysis.

2106. You would admit that the fixing of a low standard would allow of the watering down of a richer sample by unscrupulous persons?—My argument is that the trade ought to be protected, and that we think it is a fair minimum.

2107. I put it to you while you say the retailer ought to be protected, so that he should not be subjected to prosecution on a sample taken that had been lying on the counter for a long time, do you not feel equally that the consumer ought to be protected in having a good quality of milk given him, and that he ought not to be necessarily subjected to have the milk which has been standing on the counter?—That is so. It has always been my study and practice to try and put into the hands of the public as good an article as possible. I try to buy from the best sources, but I say that we are supplied altogether by the product of Ayrshire cows, which show a lower standard of milk, and therefore I have arrived at this conclusion from practical experience, and from analyses taken, that 2·75 is a fair and reasonable standard to fix for Scotland and for Glasgow.

2108. Do you sell any large quantity of separated milk yourself?—I do; I happen to be agent for one of the large creameries, and I supply the other dairymen all over the city, and the suburbs for orders.

2109. What becomes of that separated milk mostly?—I suppose you are aware that the Scotch nearly all have their porridge and milk in the mornings, especially among working families; and in the working neighbourhoods some districts will have double the quantities of skimmed that they do of sweet milk. The public are getting the benefit; they are getting double the quantity, or more than double the quantity, that they get of sweet milk.

2110. Does there not exist any prejudice against separated milk?—No. It does not pay us so well as selling the sweet milk, but the public desire it. They cannot afford to pay for sweet milk, where there are six or seven or eight of a family of a working man earning perhaps 25s. a week.

2111. So you get a good sale for separated milk?—That is so. There is a great demand in Glasgow for it.

2112. In regard to what you were saying about the quality of the separated milk, and the possibility of having hand-skimmed milk, no better in quality than some kinds of machine-separated milk, you would, I take it, admit that this depended entirely upon the relative efficiency of the two operations?—That is so.

2113. If a mechanical separator was not working properly it would let a lot of fat go through?—Yes, or if there was careless manipulation.

2114. It would be a matter of how the thing is worked?That is so. I get it sometimes with a drop of cream, and then it is a fairly good sample of milk; and at other times I get it very well separated.

2115. Have you anything to say as to the quality of the separated milk you sell; what fat is there in it; you do not guarantee any amount, I presume?—0·15.

2116. 0·15 is an uncommonly good separation, I think?—I do not know. That just happened to be the bottom of a tin I had supplied to another individual, and he had got the sample analysed.

2117. That is machine separated?—Yes, and that was not a dip of the dish, that is just what was left.

2118. You do not sell any hand-skimmed milk, do you?—We do.

2119. Have you any particulars about the amount of fat in that?—The public do not ask for either hand or separated skimmed milk; they merely ask for skimmed milk.

2120. You sell the two indiscriminately?—We do.

2121. Under what name do you sell it?—I may say for your benefit that we get our cream taken off in the case of the hand-skimmed milk—that cheap quality of cream—by the farmers who lift that cheap cream chiefly themselves at the farm.

2122. You do not mean that the milk which they gave in of this 2·7 quality has had the cream taken off by the farmers first?—No, certainly not.

2123. The milk that we have stated in evidence is of such poor quality, has not been deprived at the farm of a certain amount of cream?—No. I say that I have a warranty with each consignment of that milk for its purity.

2124. And that none of the fat is removed?—That is so. We get hand-skimmed milk sent in from the various farms also. The cream that we sell is that poor article of cream that I have spoken of, and the balance is sold as skimmed milk.

2125. This that you have, part of it skimmed by hand and part of it separated by a mechanical separator, under what name is it sold?—Is it skimmed milk that you are referring to?

2126. You tell me that some of it is separated by a mechanical separator?—Yes.

2127. And some of it is sent in hand-skimmed?—That is so; we do not differentiate at all; they do not know.

2128. Do you mix them together?—We mix them together very often.

2129. And sell the mixture as what?—As skimmed milk. Sometimes they may get separated milk.

2130. As a matter of fact it is not all hand-skimmed milk?—As a matter of fact it may be, or may not. We call that skimmed milk whether the cream is extracted by the hand or by mechanical power.

2131. You do not call it even mechanically-skimmed milk?—No, simply skimmed milk, whether it be by the hand or by mechanical power.

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2132. How do you know the quality of the cream that you sell; this thin cream, containing about 9 per cent. of fat?—The way that I have arrived at it is, I have sent up several samples to the analyst.

2133. You have had it analysed?—Yes, in a good many cases.

2134. The point I want to bring out is this. You make a great point in your *précis* that the purchaser can be protected by seeing that the proportion of fat is equal to the price paid; I do not see myself any protection at all for him, unless he takes the trouble to have a sample analysed; I understand that it is solely by the appearance of it, and his tasting of it, that he can tell whether he has got the 9 per cent. cream or the 25 per cent. cream?—I may say we have never had any standard for cream at all in Glasgow, but we thought it would be better to be prepared in the event of you fixing a standard for cream as well as milk. That is the reason why. If you do so we consider that it would be a very great hardship that you should put us alongside of the English custom.

2135. You prefer not to have a standard for cream at all?—Yes.

2136. So you would not object to selling this cream if it only had 5 per cent. of fat instead of 9 per cent.?—Of course, if you fix a standard we should like you to fix a low standard, say, 9 per cent.

2137. Have you anything to show to us that the thin cream has got anything like 9 per cent.?—Yes. I have here the samples of six creams that are sold to the public. One of them was sent from my own place, one from another brother dairyman here, and two of the samples were procured by Mr. Stirling, who agreed to see to their being analysed. Six of us just agreed to send samples to the analyst, and here are the results; you see how they are. (*Handing in analyses.*)

2138. (*Professor Thorpe.*) Do you at the moment officially representing your Association, concur with Mr. Stirling in the suggestion that if a limit of fat be fixed as regards cream, it should be 9 per cent. in the case of what you call cream, and 30 per cent. in the case of what you call double cream?—I quite concur.

2139. (*Mr. Murphy.*) Is it practicable to work to a standard in cream?—It is a very difficult thing to do, very difficult indeed, because it is of such a nature that we are dependent on the extractor; we are dependent on the man who is in attendance, or we may be dependent on the farmer who is extracting the cream by hand. It may vary 1 per cent. or 2 per cent.; it may vary from one day to another. It does not follow that every day you will have the same quality. The weather affects the creaming of milk by hand very much. It is a very difficult thing to fix a standard for cream, or to arrive at what is really the standard, unless you are getting it analysed from time to time.

2140. Cream is obviously a manipulated article?—Yes.

2141. Is the machinery of the business such that it would be possible to separate your cream to the required standard?—According to my experience it can't be done; 54 per cent. of butter fat is about the heaviest we can lift it.

2142. Would it be better to take some one maximum, and always work up to that, and leave people to make their own arrangements in the shape of dilution?—I may say it is a very small quantity of double cream that is used in Glasgow. It is only used for whipping purposes, when something special is on—a marriage or a dinner, or something very special. It is only a few dairymen of us who have such a thing; dozens of dairymen have never sold a gill of it.

2143. The bulk of the cream, I think, in Glasgow you say is used for tea?—That is so, and every dairyman has that quality.

2144. That is rather a low quality cream?—That is so.

2145. Do you think if a higher standard were fixed that the public would learn to dilute their own cream so as to bring it down to the standard they require?—I am afraid we would require to adopt a new name, and sell it as we have been doing. As we have done it we require to call it cream. It would revolutionise the whole trade, as we have been accustomed to work, and there would be very great hardship on the working classes. We would require to get out of it some way.

2146. It would be no hardship to the working classes if they received cream of higher quality?—We can give them that now. If a working man's daughter or son is getting married, and he wishes whipping cream for special purposes, he can get that now; but a great many of the smaller dairymen do not keep that class of cream, and when this special cream is asked of them they have to apply to the larger dairyman for a supply.

2147. Could not the trade arrange it so as to supply a good cream with 25 per cent. of butter fat, so that the public could dilute it if they want it for their own purposes?—I do not think that would meet us universally—not all over; a very small proportion of the citizens would go in for it—just very few.

2148. What would be the effect, supposing a 25 per cent. standard were to be fixed for cream?—The effect would be that the working classes would not get any cream at all.

2149. You do not think they would buy the cream in smaller quantities and dilute it?—I am sure they would not.

2150. They would go without?—You could not buy, perhaps, less than threepennyworth, and they cannot afford to pay that.

2151. They could buy a smaller quantity?—I say you could not get less to purchase of cream at that percentage of butter fat. No dairyman will sell you less than 3d. or 4d. of cream when you go beyond 30 per cent. of fat. The gill is the smallest quantity, I think, I have ever sold of very thick cream.

2152. (*Mr. Barham.*) It has been suggested that if a minimum of 2·75 per cent. of butter fat were fixed, it would be possible to water milk down from, say, 4·5 per cent. of butter fat to the limit of 2·75; now, as a matter of fact, would not the analyst look for water or judge of the amount of water by the non-fatty solids in the milk?—I would say he would judge the amount of water by the non-fatty solids.

2153. So that it would not matter what percentage of fat is in the milk, the water would be discovered just as easily whether there was only a small percentage or whether there was a large percentage, as the case may be. One as readily as the other?—That is so.

2154. So that it would not be possible for anyone to water milk containing 4·5 per cent. of butter fat down to 2·75 per cent. without being discovered?—That is my view.

2155. You have a table, I think, showing the produce of 30 herds?—Yes; I have a table.

2156. I think you said that three months out of the year each one of those herds had come below the standard?—That is in cases even from a creamery where they pay by results; but I have about 30 farmers' supplies of my own, and a large number of them touch on 3 per cent., some of them being below 3 per cent., some of them slightly over.

2157. What did you mean by saying "So many times in the year"? Did you mean that the average of a month was below the standard, or did you mean that one meal only was below the standard?—At various times; taking the different times of the year this is the product coming from eight different farms, and out of the eight three of the supplies, according to the analysis, are under 3 per cent. to begin with, two supplies touch 3 per cent., two supplies are 3·2, and one out of the eight supplies shows 3·3 per cent. of butter fat. That is the analysis of the eight lots.

2158. (*Chairman.*) In connection with the cream, have you any instances where any of the dairymen have been prosecuted for selling this particular kind of cream under the 9 per cent.?—No, it is a long time ago that we had a case brought up in Glasgow by a noted man named Morton who was connected with the City Bank of Glasgow when it failed; he went into the dairy trade latterly, and a sample of his cream was bought on one occasion, and it was found to be not much better, I think, than sweet milk; it was a very low standard.

2159. What happened?—He lost his case in Glasgow. That was the first and only case I remember being tried in Glasgow. The case was lost, but it was taken to Edinburgh, and the lords sat in judgment on it there, and it was decided that there was no standard for cream.

2160. So there was no conviction?—There was no conviction.

2161. So it is left to the honour of the dairymen of Glasgow to see that they keep this cream up to this 9 per cent. standard?—That is so.

2162. You cannot tell us anything about condensed milk, I understand?—No, we do not deal in that at all.

2163. You cannot give us any evidence on the subject?—No.

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2164. (*Professor Thorpe.*) Condensed milk, of course, is imported into Glasgow?—That is so.

2165. Is it ever used to make up the supply?—I never knew of one solitary instance; I have never done in all my experience.

2166. You are not aware of its being done in the trade?—I am not aware.

2167. This separated milk, or skimmed milk, as you call it, is sold very largely among the poor, I believe?—Yes, as skimmed milk.

2168. Of course as skimmed milk?—Not only among the poor, but all over; among the rich as well as the poor for pudding purposes, for cooking.

2169. Do poor people use it at all extensively for the nourishment of children?—No, usually they purchase for baby feeding (for bottles) sweet milks. This skimmed milk is usually used for porridge purposes. Then ice cream vendors use it largely; in some cases they order half sweet and half of this separated cream, and they put the two together, and make ice.

2170. I gather from you that it is not sold for the nourishment of infants?—No, we do not put it down as that, we do not advocate it for nourishment of infants.

2171. (*Mr. Farmer.*) At what time of the year do you consider milk to be the poorest?—The spring—about this time, just before the calving time.

2172. Is it poorest just before grass in May or June?—I say then that milk is about its average good quality, fair quality; the cows have perhaps a month or two calved then.

2173. I notice that these low quality milks of yours are in the winter months?—Yes.

2174. And that some dairies are very much higher when you have got to May and June?—You may increase the quality by feeding. You cannot work the farmer up any other way; he must feed his cows, as I have said.

2175. (*Professor Thorpe.*) It is a question of feeding?—Not always, but I admit that has a good deal to do with it, but a farmer cannot afford to give the cows better food than he is able to afford.

2176. (*Chairman.*) I use a great number of Ayrshires in my herd, and I am glad they give a rather higher percentage than you have in Glasgow?—But we have not those mixed herds. Out of all the herds we have I do not think we have a Guernsey in them, therefore I think it would be hard to put us on the same level with you in the South of England, judging from the analyses in the books that we read of.

Mr. Charles Marshall, called; and Examined.

Mr. C. Marshall.

2177. (*Chairman.*) You are sent here to represent the Northumberland and Durham Dairy Farmers' Association, I understand?—Yes.

2178. You are farming yourself?—Yes.

2179. In Northumberland?—Yes.

2180. Have you got a large farm?—I keep about 45 to 50 cows; I breed them mostly myself.

2181. And you supply milk?—Yes.

2182. Entirely fresh milk?—Entirely fresh milk—not entirely wholesale, but very nearly.

2183. You sell it in bulk, in point of fact?—I sell it nearly all in bulk.

2184. You are going to give us evidence as to the quality of milk produced by a large number of dairy herds in Northumberland and Durham?—Yes.

2185. You having hundreds of analyses of the milk of those herds?—Yes, but I do not know that I can put hundreds of analyses before you.

2186. You could give us a summary perhaps, and tell us who analysed the milk, and what processes were adopted in arriving at the conclusions?—The milk was mostly analysed by the Dundee city analyst.

2187. Is that Mr. Macdougald?—Yes.

2188. Can you give us shortly what is the result of these analyses as shown in these particular herds?—I might begin perhaps with my own herd. On August the 22nd, 1898, the total solids were 11·26, the fat 2·75, and the solids not fat 8·51; on September the 1st, in the same year the figures were 11·87 for total solids, 3·11 for fat, and 8·76 for solids not fat; on October the 12th, of the same year 13·59 total solids, 4·82 fat, and 8·77 solids not fat. In 1899, on February the 13th, the analysis showed 12·08 total solids, 3·60 fat, and 8·48 solids not fat; on February the 18th, five days after, 11·39 total solids, 2·75 fat, and 8·64 solids not fat; on the 28th February, ten days after, 12·80 total solids, 3·85 fat, and 8·95 solids not fat. That was the whole herd. Of course, I am not going to say whether it was tampered with or not, but it was my own milk.

2189. Before you go to the feeding, was this morning or evening milk, or both?—It was evening milk, every drop of it. The feeding was 4lbs. of decorticated cotton cake, 4lbs. of maize meal, 5lbs. of oat dust (oat dust is the dressing from making oatmeal, and analyses pretty nearly the same as oats), 2 to 3 stones of roots (swede turnips mostly), and hay as much as they cared for. The cows were of all ages; they were a heavy milking herd, the average for several years being within a fraction of 900 gallons per cow per annum. I go in for big milkers, but many of them are young ones; I have run from 874 gallons to 906 gallons during the year for every cow and heifer on the place for several years. That is my result. I can give you a great many more analyses of my own herd if you think that it is necessary. These were a few that I took out as showing the extreme variations produced from what I cannot tell except this—that I find on going through a number of analyses from the 22nd of August to the 1st of September, that five or six herds have been at the very lowest of the whole year. The autumn of 1898 was an extremely dry, hot time. The cows were very heavily fed, and so far as I know were never pinched for feed at all, except perhaps they would have some little difficulty in filling themselves on the pastures; but you see they got a heavy feed in the house. That is the winter feed, and we feed winter and summer practically the same, except that we get grass in the summer. Here is another herd——

2190. You have not got results of all the herds boiled down in one abstract, have you?—I can give you the average of most of them; I can give you the average of my own at any rate. It was taken thirty-four times from May the 12th, 1898, to April the 1st, 1899. The average is 3·75 butter fat——

2191. Did you say 3·75?—Yes, remember this is evening milk—and 8·51 solids not fat. On the 19th September it was 8·47 solids not fat; on the 14th September it was 8·47; on the 4th October it was 8·47; and on the 28th October it was 8·40, and it has been up so high as 9·33. Then I have another here—Hunter's, of Bradley Hall Farm. He has 70 cows. His winter feed is 6lbs. of bean meal, 4lbs. of maize meal, 4lbs. of decorticated cake meal or cake, 2½lbs. of bran—16½lbs. of purchased food per cow daily. This was made into mashes with cold water; I believe th water is slightly warmed occasionally, but it is not made hot. Then there were about 50lbs. of turnips with two servings of the best seed hay, and two servings of meadow hay, in all cases as much as they would eat. Newly-calved cows get bran mash only. I have taken out a few of the analyses of this man, but I do not know whether I have his herd fully or not. On August 22nd—the exact date of which mine was the lowest—his showed 8·48 of solids not fat, and 2·69 of fat; on October the 25th the same year it was 8·99 solids not fat, and 4·05 fat; on December the 2nd of the same year it was 8·68 solids not fat, and 4·90 fat. The summer feed of these cows is 4lbs. of bean meal, 3lbs. of decorticated cotton cake, 2lbs. of bran, and 5lbs. of compound cake—what the compound cake is I cannot tell you. These 70 cows graze over 90 acres, and they get about 90 acres of the foggage after the hay is taken off; about one-half of the cows are fed off each year, the other half are calved.

2192. (*Mr. Barham.*) Was that August of this year?—It was August, 1898. Then Dickenson, of Shotleyfield, has a herd of 13 cows; he feeds 6lbs. of maize meal, 6lbs. of compound cake, but mostly decorticated. I do not quite know what that means; I fancy he gives 2lbs. or 3lbs. of compound cake (because I have had a letter from him explaining it), and 3lbs. or 4lbs. of decorticated, and 4lbs. of bran, and 2½lbs. of malt screenings. That is 18½lbs. of concentrated food; it is a grass farm, and he has no roots; but they have as much hay as they will eat. Cows in full milk and that have been fattened off

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get this; others drying off get not so much. His analysis is, curious to say, on the same date exactly of the same year, August 22nd, 1898: Of solids not fat 8·63, and of fat 2·98; on October 25th, of solids not fat 8·91, and of fat 4·18; and on November 18th, of solids not fat 8·75, and of fat 4·70. The summer feed is 2½lbs. of Bibby cake, 2½lbs. of decorticated cotton cake, 5lbs. of maize meal, and a handful of bran mixed and damped.

2193. Are those all evening milks?—Hunter's is sometimes evening's and sometimes morning's—this man's is evening's.

2194. Have you got any morning's milks anywhere?—I can give you morning's milk afterwards.

2195. (*Chairman.*) I suppose you give us these three as pretty good examples in your district—we cannot go through the whole county; but I take it these would be pretty well representative?—Yes, they are pretty well representative.

2196. The other herds you have got are pretty much of the same sort?—Some of the herds I have got do not come quite so low as that. The point I was wanting to emphasise is this: that with that very heavy feeding we occasionally get an exceedingly low quality of milk, why I do not know, but it is the case; I find that in August and September, 1898. Then we had a special run of low samples all through Northumberland, and we had the same thing happen in 1899, about the same time of the year; we find that let us feed as we like; and the difficulty is this, they vary so quickly. It is sometimes said you can appeal to the cow; if I appealed to my cows in that way four days after, the cows would have said I was a liar. I have another, if you care to hear the figures. He gives 2lbs. of maize meal, 2lbs. of ground oats, and 2lbs. of bran, 2lbs. of malt screenings, and 5lbs. of compound cake, which is an unknown quantity.

2197. (*Dr. Voelcker.*) And quality?—Yes; about two stones each of hay and a few turnips. I have added my note to that "Probably the hay is guess work, but means as much as they will eat." His analysis for September 1st, 1898 (seven or eight days after the others), is 7·27 solids not fat, and 2·93 fat; on October 25th (about six weeks after) 8·60 solids not fat, and 4·29 fat; and on November 18th he has solids not fat 8·84 and fat 4·75.

2198. (*Mr. Farmer.*) Can you tell us who took the samples of this milk?—Yes, the samples of this milk were taken at Newcastle by the manager of the Co-operative Dairy, who is an exceedingly careful man in doing it. The way he does it is this: he takes a churn of milk, he sets another churn alongside, he turns it over into it, and turns it back, and then turns it back again, and he gives it four turns before he takes a sample.

2199. Did that same man take the samples of all these milks?—Yes.

2200. Did the same man analyse them all?—Yes.

2201. And they vary in butter fat more than two points within three or four days?—Yes, that is so.

2202. One is 2·69 and 4·90 within about four days, just on the same feed?—That is so. I can give no explanation of it except this, I think it is a possibility that some of these days have been very hot, and probably the cows have been galloping. That is the only suggestion I can make, that the cows have been galloping with the heat. I firmly believe that every sample of it is genuine milk.

2203. (*Dr. Voelcker.*) I understand that these samples you have been speaking of were taken at Newcastle?—Yes, after coming from the farm.

2204. (*Mr. Barham.*) Is Mr. Carrick connected with the Co-operative Dairy?—Not at all; it has no connection with him.

2205. (*Chairman.*) Mr. Carrick's gathering grounds are more to the west, I think?—He has a few nearer in, but as a rule his milk comes from away west and from Scotland. These are gathered nearly all of them down the Tyne.

2206. (*Dr. Voelcker.*) These samples are taken into Newcastle?—Yes.

2207. So are Mr. Carrick's, are they not?—So are Mr. Carrick's, too, but I cannot quite speak for Mr. Carrick. Do you wish for any more of these analyses?

2208. (*Chairman.*) Not unless you have any different ones; I take it the analyses you have brought forward are representative pretty well of the milk supply in your district?—Yes.

2209. Have you any very different that you wish to call our attention to, because there is no use going over what is practically the same ground again?—No. I can give you a great many more of the same character.

2210. If they are all about the same, and show the same results, we can take it for granted that what you have given us is fully representative?—Will you allow me just to give you a few of the different herds? I have taken the highest and the lowest during the year. I will put it in a very short way. Here is one man. On October 6th, 1899, his solids not fat were 8·69, and the fat 4·20; on August 15th, of the same year—which you will notice is very nearly the date of the last, but a year different—this same man's milk gave 8·47 of solids not fat, and 2·45 of fat. Then we come to August 15th, 1899——

2211. Two analyses made on the 15th August?—Yes, but this is a man of the name of Dodds.

2212. Another man?—Yes. His milk showed 8·52 of solids not fat, and 2·65 of fat; on October 6th, the same date as the other man, 8·76 of solids not fat, 4·25 fat. On August 15th a man of the name of Bramwell had an analysis showing 8·43 of solids not fat and 2·60 of fat; on October 6th again the same man Bramwell had 8·74 of solids not fat, and 3·70 fat. On April 11th, 1899, a man of the name of Elsdon had his milk analysed, and it showed 9·19 of solids not fat, and 2·95 fat; on June 1st the same man's milk showed 9·07 of solids not fat, and 4·10 of fat. On April 1st a man of the name of Parks' milk was analysed, and showed 8·94 of solids not fat, and 4·10 of fat; on June 23rd the same man's milk was analysed, and showed 8·81 of solids not fat, and 2·95 of fat.

2213. Just reversing the figures of that other man—that is rather curious?—What I wished to show is the variation through causes over which the farmer has no control.

2214. (*Major Craigie.*) Are these the means of a large number of cattle in a herd?—Yes, these herds would be running from 25 to 50 each.

2215. (*Chairman.*) Do you know who analysed this last?—It was done by the same man.

2216. (*Mr. Farmer.*) At Dundee?—All that I have given you yet are by Mr. Macdougald.

2217. (*Chairman.*) Were the samples taken at the farm?—The samples that I have given you were taken at the railway station—at the receiving station at Newcastle.

2218. (*Professor Thorpe.*) Are the churns locked as they go in?—No, they are not locked, but we have no reason to suspect that there is anything goes wrong, because we have not unfrequently followed the cans down, and we have never been able to see any tampering. Besides, it would be very curious if all these people that were sending milk on one particular day had all their cans tampered with. I think it points to a variation in the weather; I can see nothing else. These are from a somewhat wide district, although it is all in one class of district, so it seems to me to be that. I can give you the difference of the same dairy's morning's and afternoon's milk. This is a herd of cows in the neighbourhood of Newcastle, and the milk was sent in, and was found to be deficient in fats, so a man was sent out to see the cows milked, and to bring the milk in, and send it away to be analysed.

2219. (*Professor Thorpe.*) To whom?—To Mr. Macdougald still. He is the man who analyses for the Co-operative Society. They are exceedingly particular in having their samples taken; they take them practically every week, and send them out to him.

2220. (*Mr. Farmer.*) Is it Mr. Macdougald, of Dundee, or Mr. Macdougald, of Newcastle?—Dundee.

2221. (*Chairman.*) I see he is the city analyst of Dundee?—Yes.

2222. How can he do the Dundee work and carry on the Newcastle work?—I do not know. I cannot answer for him. These are samples taken from one herd of 20 cows. On July 28th, 1899, the morning's milk was 11·65 total solids, and 3·10 of fat; on the same day from the same cows at 1·30 there was 13 per cent. of total solids, and 4·40 of fat, showing 8·60 of solids not fat; on August 12th—again in August, you will observe—the morning's milk was 8·60 of non-fatty solids and 2·40 of fat; the evening's milk on the same day, milked at 1.30, was 8·54 of non-fatty solids and 3·65 of fat.

2223. (*Mr. Farmer.*) You say milked at 1.30; what time do they milk in the morning?—At 6 o'clock in the morning for this suburban delivery; it is delivered warm.

2224. Then there is about 7 hours' difference in the one case?—Yes.

2225. And 16 or 17 hours in the other?—Yes. Here is another herd of 13 cows; time of milking 4.30 in the afternoon and 6 o'clock in the morning. On July 15th the analysis showed 8·55 non-fatty solids and 2·80 of

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fat, in the morning's milk; the evening's milk, on the same day from the same cows, gave 8·97 of non-fatty solids and 3·95 of fat. On August 5th the morning's milk was 8·58 solids not fat, and 3·65 fat; the evening's milk being 8·53 solids not fat, and 4·30 fat. Here is another herd of 50 cows with a uniform time of milking of 4.40. On September 11th the morning's milk was 8·48 solids not fat, and 3·60 fat; the evening's milk was 8·62 solids not fat, and 4·15 fat; on October 14th the morning's milk was 8·86 solids not fat, and 4·05 fat, the evening's milk being 8·82 solids not fat, and 4·20 fat.

2226. (*Chairman.*) This gives a herd of 50 cows, and you took one churn at random. Therefore it does not at all follow that you analysed the milk of the same cows?—I suppose so.

2227. It cannot be quite so—it does not at all follow that it really is the milk of the same cows?—The way in which it is nearly always done in our neighbourhood is this: We have a vat holding from 12 to 20 gallons of milk; as the milk is brought in it is put into this vat, run over the refrigerator, and the cans are filled one after another. Possibly there may be a group of cows that are slightly various, but I have never known any variation—at least, no variation worth noting—when the samples of two or three different cans have been taken. I can quite imagine that an objection might be made to it in this way—that occasionally such a thing might arise as a group of bad cows, as I have said, but in practice, I think, it very rarely happens.

2228. Then you would not be afraid of it standing, as a rule, a good analysis; you heard the last witness tell us that he was afraid that, judging from a single churn taken out of a lot like that, great injustice might be done?—Yes. But they are doing it a little differently in Scotland from the way I am speaking of. They begin to milk perhaps at 3 o'clock in the morning, and from their having to get away into the town as quickly as possible, as fast as the cow is milked—the cows are taken cow after cow, and the milk is not cooled, not put into a vessel at all, not mixed in the slightest degree, but one cow's milk after another is just put into a single vessel, and when that vessel is filled, it is fastened up, and goes away. As a rule, they have smaller vessels in which to carry the milk, usually about eight-gallon barrels—and we have from 12 to 17 gallon cans.

2229. So you do not think there is an element of error likely to creep in in that way?—I think that practically there is not much fear, but there is certainly a possibility—I can imagine it, although I never saw it. Here will be a dairy of 50 cows. There are five or six milkers in various parts of the byre; they are just taking the cows as they come at them, and the cows' milks get mixed up together; so that really I do not think myself, as a practical man, there can be much chance of that.

2230. (*Professor Thorpe.*) The cows average themselves, in fact?—They average themselves pretty nearly.

2231. (*Chairman.*) Then you may take it that it is really a very fair way of getting at the quality of the different morning and evening milks?—I think so. I can honestly say that I believe these figures are as true as it is possible to get them. There is always the element of having been tampered with on the railway; but, as I said before, here are a dozen men sending in, and you find them on pretty near the same day at very near the lowest point; it is too much to expect that the railway company's porters have united to steal all the milk that night, and put in water; I can hardly quite think that.

2232. I am sure they would not do it on the North-Eastern?—No, they would not do it all one night, I think. I think I have given you what I have to say under the first three heads of my synopsis. I have given you the quality of the milk produced at regular periods of milking; and now I should like to say something as to the effect on the milk during carriage, and the necessity of care in sampling such milk. On this point a prosecution was instituted in the county of Durham, and if the farmer to whom it belonged had not been a good fighter he would have been condemned; but he had the faculty for fighting, and so he fought the thing out, and it was proved that the milk was sampled so very badly that he won his case. In doing this he sent four samples of milk away, and followed them into town, watching them all the time. They were put in the Scotch barrels—he is a Scotchman this man—and in the bottom of the barrel is a tap—you know the little circular piece in the barrel just here (*illustrating*). The barrel stands in this way, and the milk is taken out of this bottom piece after it stands a bit. He got the milk taken at the farm. The non-fatty solids were 8·25, and the fat was 3·78. He and the analyst followed the cart down, and as soon as he got into Sunderland, about three miles off, they took a sample again from the bottom as the man had taken it before.

2233. Who are "they"—the same people?—The analyst, Mr. W. F. Keating Stock, of Darlington—what position he holds I do not know.

2234. (*Dr. Voelcker.*) Not the Dundee man?—No. As I said, he took a sample from the bottom as it had been taken before, with the result that about an hour and a-half after it might be, the non-fatty solids were 8·50 and the fat 2·71. The milk was then put into the dairy and allowed to stand a little, and another sample was taken, with the result that the solids not fat were 8·20, and the fat was 2·2. I might say this was a third barrel, but it was taken in the same way. Then the fourth barrel, taken about three hours after, showed 8·96 of solids not fat, and 1·75 of fat.

2235. (*Chairman.*) Do I understand that these are samples of different barrels—barrel 1, barrel 2, and so on?—No. 1 was a sample of all milks mixed together; Nos. 2, 3, and 4 were different barrels that were sampled at different intervals, and from an hour and a-half to about three hours and a-half.

2236. (*Mr. Barham.*) All filled from the same bulk?—All from the same dairy and the same cows, as far as we know.

2237. The same bulk mixed together?—Yes, here is another one that was taken from the top and the bottom of the same vessel—I do not know whether you care for that—by the same man, but only the butter-fat is given here. From the top it was 3·15, and from the bottom it was 2·19.

2238. Will you tell us the time; what interval had elapsed between these different samples being taken; the first one was taken at the farm I think you said?—Yes.

2239. The second at the railway station at Newcastle?—It was driven in by the man's own cart, and was followed in by himself, another gentleman, and the analyst.

2240. And sampled at once?—They never lost sight of it. The first one was taken into the dairy about an hour and a-half after—after driving 3½ miles, and it was allowed to stand a little. The last would be about three hours and a-half after.

2241. Was it drawn from the top in the last three barrels?—Yes, that was done in order to show that the sampler of the milk for which he was being prosecuted had taken the sample badly.

2242. (*Professor Thorpe.*) I think I should like just to be quite clear. Do I gather from you that the gentleman—Mr. Keating Stock—followed a particular sample of milk, taking samples from it at different intervals?—Yes.

2243. Was it the same sample of milk?—No. 1 of these samples was a mixture of the three barrels.

2244. What was No. 2?—No. 2 was a barrel that the milk was taken from about an hour and a-half, probably, after—after driving 3½ miles, but not standing at all.

2245. Was No. 2 strictly comparable with No. 1—it was not the same thing, was it?—No. 1 is a mixture of Nos. 2, 3, and 4. It was supposed the milk was the same that came away.

2246. Assuming that to be the case, you say No. 1 was a mixture of 2, 3, and 4?—Yes.

2247. How does it come that when we mix 2, 3, and 4 together the individual total solids of which are in the case of No. 2, 11·21, of No. 3 10·40, and of No. 4 10·71—produce an aggregate total solids of 12·03?—I cannot explain it. It seems to me that you are analysing skimmed milk in Nos. 2, 3, and 4.

2248. But that does not matter in the total solids?—Not when you take the butter fat out.

2249. (*Dr. Voelcker.*) If you take the volume of water that would show there is something wrong about the analysis?—I beg your pardon, but I cannot quite see so. We are analysing skimmed milk. There would still be the butter fat in the vessel, but not in the part where the milk is taken from.

2250. The total solids not fat ought to have increased to make up the deficiencies?—On No. 3 there seems to have been a discrepancy, but not on the other two.; 8·25 is the mixed milk, 8·50 is No. 2, and 8·96 is No. 4, which is practically what I believe Professor Thorpe would say was right. On the 8·20 there must be a discrepancy, why

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I cannot say, as I did not analyse it, and if I did I could probably not have said so. It is only on No. 3 there is a discrepancy.

2251. (*Professor Thorpe.*) There is a discrepancy all the way along, the numbers do not agree among themselves at all?—Is that so?

2252. (*Mr. Barham.*) These were analysed by a county analyst, were they not, for the purpose of defending a case?—Yes.

2253. (*Professor Thorpe.*) Would you kindly give us some information about the analysis by the Dundee analyst; this gentleman, I understand, is retained by your Association to make these analyses?—The Association was not in existence when these analyses were taken; it is a very recent one. The fact of the matter is that this Association has been worried into existence by the continued interference of public officials. We were not in existence at this time, when these were taken.

2254. Then these samples were sent by individual traders to Dr. Macdougald?—Yes.

2255. Why did all the individual traders send to him?—I do not know. I suppose they would get it as well and cheaply done.

2256. "Cheaply done." May I ask some question about that? Would you mind telling the Committee what you paid for these analyses?—I do not know what they paid.

2257. Was there any arrangement for doing them by contract, or any thing of that kind?—Yes. I should think there was.

2258. Do you know a paper called the "North British Agriculturist"?—Yes, I have seen it.

2259. Do you know of any reflections upon this mode of analysis made in that newspaper?—No, I do not know. I should not like to pin my faith to the "North British" very much.

2260. Do you know that this gentleman offers to return a full analysis of milk supplied to him at 1s. a sample?—No, I do not know that.

2261. (*Mr. Barham.*) I should like to ask the witness whether Dr. Macdougald is the public analyst for Dundee?—I believe he is.

2262. Therefore the milk in the ordinary way would be analysed by him, of all the dairymen and dairy farmers of Dundee, and the neighbourhood?—Yes, I suppose so.

2263. (*Chairman.*) We must pass on to your last point as to the necessity of samples being taken at the booking stations?—I have no real evidence to give on this point, but it seems to me to be desirable that a man should not be summoned and prosecuted on an analysis of milk that has stood for some time in the railway stations. I think there would be no difficulty myself in getting at a farmer who is adulterating his milk by putting his people on oath, but I think this should not be done on milk that has been some hours out of his possession. That seems to me simple justice. Plenty of milk that goes down to Newcastle—I am not speaking specially of my own milk now—stands all night in the station unlocked and unprotected in any way. It is quite possible that this milk can be tampered with, and in the event of a sample being taken by the Local Authority I think it should always be taken at the time when it was in the possession of the servants of the producer, or immediately afterwards. That seems to me to be simple justice.

2264. The result of your analysis and enquiry into this thing is, I suppose, to show you that some standard is necessary, or do you think there ought to be none?—I cannot quite tell; I suppose that it is difficult. It seems to me that the consumer does want to be protected in some way, but whether the fixing of a standard will have that effect or not I have very grave doubts. If you fix a low standard you simply give a bonus, as it were, on bringing milk down to that standard. If you fix a high standard you necessarily fine innocent men many and many a time, and I am perfectly certain of that if a high standard was fixed—if a 3 per cent. standard was fixed or even if a 2·75 per cent. standard was fixed. I would much prefer to fix no standard and to have very strict police arrangements by which samples can be checked coming from the producer. I think that could very easily be done. For instance, if I send my milk to the station and a sample is taken there, and is found to be deficient in fat, what is to hinder all my people being summoned and asked if they have ever known any one tamper with the milk. I presume if I was murdering one of my people you would get them up and have them examined; you would not just condemn me because I could not prove I had not done so. That is what I fancy is being attempted to be done now; you are throwing the onus of proof of the farmer's innocence on himself. That is what I consider to be contrary to all English law. On the other hand, I know that it is desirable to raise the standard of milk if possible, and to certainly see that milk is delivered as it is produced by the cow; but so far as I can make out, we should be fixing a standard for a natural product, and there is not a natural standard for it. We are fixing an artificial standard for a natural production. Now, if milk was an article that could be produced at will thick or thin, then I could see the justice of it; but when the farmer himself does not produce and the cow does—and I think I have shown that there are very startling variations according to the weather—I think it is not at all just that a man should be brought up for this. Then in order to catch the man who gets the milk and takes it to his customers and adulterates it on the road, I would suggest samples of the milk being taken pretty frequently at the railway station, and then the men can be caught in the delivery and samples taken from them. Many of my friends who have had something to do with the delivery of milk—many farmers who deliver milk into Newcastle—say that there is a habit amongst the inspectors of coming just as a man is going home with perhaps a quart or two of milk in the bottom of his can, as has been spoken of by gentlemen who were here before—that is the time when they get it. Of course, a highly intelligent police officer wishes to have a conviction if possible, and he very naturally takes the time when he has a chance to get it. No doubt people ought to be able to mix milk up theoretically—practically it is not possible to do it. If they mix the milk up as they are delivering it, they would have churned milk before they could get round. I could give you one instance in which over 200 customers are supplied out of one large can. It takes between four and five hours in delivering it, and more than once samples have been taken when that man was going home with just a couple of quarts of milk in the thing. Fortunately, so far there has not been a conviction in that case, but I believe they have been exceedingly near run once or twice. That just shows the very difficult position in which we are placed. You will see from the feeds that I have given you, that feeding does not seem to have much to do with it.

2265. (*Mr. Barham.*) Supposing this Committee decided to fix a standard, what limit do you think that should be?—I certainly would not go above 2·75, but I would much prefer to have no standard fixed on which to prosecute a man. But I would put him into gaol if I found him out. I would not give him the option of a fine.

2266. (*Chairman.*) How are you to find him out unless his milk falls below a certain standard?—You can easily find the producer; I think you can easily catch him, but I do confess there is a little difficulty in catching men who are going out and getting 20 gallons, and no other body has anything to do with it. The only way in which that can be done, so far as I can see, is this—that the milk should be pretty frequently sampled—say at Newcastle Station, and then the man could be caught in the middle of his rounds, and if there is a considerable discrepancy, then I think you would find that you would catch him.

2267. (*Dr. Voelcker.*) If we have no standard, how are you to say when milk is not genuine?—That I cannot tell. I am not a chemist.

2268. You say samples are to be taken, and if found to be deficient in fat then he is to be caught; what is the standard you will give?—If you take the natural standard that the cow gives, you will take a very small one, and I do not see why you should take a standard that is not a natural standard. What I think people are driving at now is to get a non-natural product under the guise of a natural one.

2269. Have you any evidence to show that 2·75 is an average standard?—Allow me to say that an average is not what we want to be at; we are not fined on the averages, we are fined on the particular sample.

2270. (*Professor Thorpe.*) But that, as a rule, is a mixed product, is it not—a mixture of the milk of different cows; you are not fined on the produce of an individual cow, are you?—We are fined when they can catch us having a low standard of milk; it may be the product of 50, 70, or 100 cows all mixed together; and not infrequently that milk comes below the present standard, as I have shown you.

2271. You mean on that analytical evidence?—No;

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there is another analysis where the milk was taken from the place itself, and was watched all through, which shows exactly the same thing.

2272. (*Mr. Cowan.*) May I ask what kind of land those cows are going on?—My land is on the mill-stone grit and on the gravel; that of Mr. Dickenson's is somewhat stronger land; and that of the seventy cows is good fertile gravelly land. One of my farms belongs to Sir Jacob Wilson, and the other belongs to Miss Grey and Mrs. Guiry; the two are together. One is on mill-stone grit, and the other is on the water gravel—several feet of deep gravel; not very good land anyway, but it is very heavily manured.

2273. What class of cows—Shorthorns?—Pedigree and non-pedigree Shorthorns and big milkers, as you see. I go in for a big milker. I like a good cow. I have no Channel Islands; I have no Ayrshires.

FOURTH DAY.

Friday, 9th March, 1900.

PRESENT:

Lord WENLOCK, G.C.S.I., G.C.I.E. (*Chairman*).

Mr. GEORGE BARHAM.
Mr. GEORGE COWAN.
Major PATRICK GEORGE CRAIGIE.
Mr. S. W. FARMER.

Mr SHIRLEY F. MURPHY.
Professor T. E. THORPE, F.R.S.
Dr. J. AUGUSTUS VOELCKER.

Mr. R. HENRY REW, *Secretary.*

Mr. CHRISTOPHER MIDDLETON, called; and Examined.

Mr. C. Middleton.

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2274. (*Chairman.*) You come to us to-day as the representative of the Central and Associated Chambers of Agriculture, I understand?—Yes.

2275. To give us your views as regards the standard of milk?—Yes.

2276. We shall be glad to hear from you what you have to say on behalf of the Central and Associated Chambers on that subject?—I think I may say in the first place that the question has not been directly before the Chambers since April, 1895—at least there has been no vote taken on the question since that time. On that date the majority of the Chambers—not a very large majority—decided that the standard ought to be 12 per cent. of total solids of which not less than 3 per cent. should be fat. I myself on that occasion moved an amendment that the standard should be 11·50, and I do not think I absolutely defined the fat then, but I was going on a standard of 2·75 for fat. I received a very considerable amount of support on that amendment; I think I was defeated by 21 to 15. If I had adopted 3 per cent. of fat and 11·50 of total solids it would have been a very near thing indeed; I do not know whether I should have had a majority, but it would have been a very much closer vote. Since then the question of what the standard should be has never been before the Chambers, and I take it I have entirely a free hand as to any evidence I give here, except to generally put the views of the Chambers before you.

2277. I understand that the Central and Associated Chambers are quite satisfied to leave the matter in your hands as a gentleman of considerable experience in this matter?—I take it so, as they gave me no instructions.

2278. We shall be glad to hear your own views upon this subject?—The principal point which I wish to put before the Committee is the very great disparity between the morning's and afternoon's milking of most cows—all cows, in fact, with which I have any practical acquaintance; and that is especially so in the district that I come from, where the business requires that there should be very unequal periods between each milking. Roughly speaking in my own case it means 8 hours and 16 hours between the two milkings. Of course, with the heaviest milking cows you can vary that a little by taking them first at the morning milking, and last at the afternoon milking; that reduces the variation of the period by from two to three hours, as milking goes on for two hours each time, and that does make some difference. Apart from the disparity between the morning's and afternoon's milk, it is quite possible at certain seasons of the year for the milk of well-fed cows—cows in very good condition, and whose surroundings in every way are good—to fall below a standard of 3 per cent. of fat in the morning. On several occasions I have not been able to reach a standard of 3 per cent. in the morning, while in the afternoon my standard was, I daresay, nearer 4·5 per cent. of fat.

2279. Does that remark apply to the whole number of cows you were milking, or to individual cows?—To the mixed milk of the whole number. I have tested individual cows; also the milk from a small herd of Guernseys, which I keep separately, and the figures of which I do not propose to put before you, as they would have no bearing upon the case; but the milk from 40 Shorthorn cows is always strained into one large vessel, and before it is run off into the churns to be sent away it is stirred up just before the dairy woman begins to draw it off—she thoroughly stirs it up, so that we shall have a uniform sample throughout. That has been my practice during the whole time I have been a milk seller. There are two or three other points I wish to mention, but shall I give the figures now in support of my first contention about the disparity?

2280. Yes, please give us your evidence in the way in which you would rather present it?—My attention was first called to this variation when I really began milk selling—when I took it up as a business. At that time I always used the cream tubes to give me a rough idea as to the quality of my milk, and I invariably found that the morning's milks stood at from 10 to 12 per cent. of cream in the tubes, according to the season of the year, while in the afternoon it stood at from 13 to 16 per cent., according to the season of the year. In the spring months it perhaps stood at 10 per cent. of cream in the morning and 13 to 13·5 in the afternoon, while in the autumn (September and October), when our milk is generally the richest, it was 12 in the morning, and up to 15 (I have known it 16 almost) in the afternoon. I adopted that rough and ready means for a good many years. I did not look upon it as absolutely correct, but I thought it was a sufficient indication as to what I was doing. The first time I had my attention called to my milk being poor was a complaint from the company, who were getting it in April, 1890, and they said that the morning's milk was below par.

2281. Par being what?—Adopting a 3 per cent. basis for fat. I took a sample very carefully from the whole of my milk—representative samples of both morning's and afternoon's milk. I labelled those samples "1" and "2," and sent them to a London chemist of some repute. His report on No. 1, which was the morning's milk, was fat 2·67; other solids 8·77; total solids 11·44. He reported: "This sample is very poor, especially in fat." No. 2 sample, which was the afternoon milk, was returned to me as 4·06 of fat, 8·80 of other solids, and 12·86 of total solids. "This sample is of very good quality." At that time my cows were getting out to grass immediately, and I had no further trouble from my customer. I have no record of any shortcomings from them till the spring of 1894, when

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weekly I was receiving very strong complaints indeed from the company that I sent the milk to that the milk was very poor indeed in the morning. They sent me two or three analyses. For instance, on February 5th they told me it only showed 11·35 of total solids, of which only 2·50 was fat. On the 7th of February (these are morning's milks I am giving you) the fat had got up to 2·69, and the total solids to 11·55. On the 9th February (in the morning again) the fat was 2·66, and the total solids 11·38. On the 16th of February the morning's milk showed 2·94 of fat, and the total solids 11·72; while the afternoon's milk of the previous day showed 3·93 of fat and 12·62 of total solids. Of course, these constant complaints gave me a great deal of trouble, and I consulted with the manager—a dairyman who had considerable experience—and endeavoured to improve it. I could not make much change in my feeding, as I was feeding what I considered a very liberal ration, and a ration with a very high albuminoid ratio. The only alteration I could well make was adding some pea meal, but I cannot say it had any appreciable effect upon the milk. In March of that year, the manager of the dairy company and the chemist to the company came down, and they took samples from every individual cow morning and afternoon. They took them themselves, and they analysed each separately, so as to give one some idea what each cow was doing. I may say I do not propose to put those figures in, because I do not think it would help you here; it did enable me as soon as I could to weed out a few of the worst individual cows. The result of the mixed milk from that test was that the morning showed 2·86 of fat and the other solids were 8·70, the total solids being 11·57; in the afternoon of that day the fat was 3·68, the other solids 8·66, and the total solids 12·35. The average of the two milkings there was 3·27 of fat and 11·96 of total solids for the day. There were still complaints for the next month that the milk was not up to the standard. I adopted all the changes I could in feeding, but I could not get it to ensure the 3 per cent. of fat in the morning during April in that year. After that the cows went to grass, and with us the quality always goes up immediately. I have no further figures accurate enough to put before you till July in that year. Then the mixed milk of the whole lot in the morning was 3·25 of fat, and the total solids 11·85; in the afternoon of that day the fat was 4·57, and the total solids 13·20. That gave an average over the day's milk—the whole milk—of 3·91 of fat and 12·52 of total solids. I had them also tested the next day. There was a slight variation, but not sufficient to put it before you, because it was practically the same. The next I have is September the 4th in that year, when the fat in the morning was 3·52, and the total solids 12·13, while in the afternoon the fat was 4·91, and the total solids 13·46. On October the first the fat in the morning was 3·52, and the total solids were 12·50, but the afternoon's fat had fallen from 4·91 to 4·31, and the total solids were 13·11. I mention these latter figures to show that these were cows capable of producing very rich milk indeed, and practically fed on the same lines, with the substitution of grass of course, in the summer for the bulky food in the winter; but except, say, six weeks in the flush of the grass they had practically the same extra feeding given the whole of the summer as they had in winter; I made practically no difference, as they always had at least 10lbs. of mixed meals and cake.

2282. Where were these samples drawn from? At the farm?—Some were taken at the farm; these where I had all the cows tested were taken at the farm. The others were taken at the dairy. The custom is that the foreman at each branch of the dairy I send to has instructions to take samples of every farmer's milk at the dairy immediately on arrival. His instructions are to take a churn of milk and turn it into another, and turn it two or three times, and then dip a vessel right down into the centre of the churn, and bring up a sample. That is sent to the chemist of the company. Most of these figures are taken in that way except on two or three occasions in the spring of 1894, when I had them taken at the farm.

2283. Had you any suspicion that there was any tampering with the milk between your farm and the dairy?—Not at all, because it was driven by my own man; there was no opportunity of that—it was only driven 3 or 4 miles, and, of course, it was never out of the control of my own servant. Then, for some two or three years I heard nothing further so I assumed that the milk was of a fair quality, and that there was no complaint. The next complaint I had was on March 23rd, 1897. Then it was getting very near the standard of 3 per cent., with the result that the analysis of a sample was sent to me which showed 3·05 of fat and 12·21 of total solids. I suppose that was to warn me that I was getting near.

2284. (*Dr. Voelcker.*) Was it morning milk?—Yes, I have not the analysis of the afternoon milk for that day. It was merely to be a warning. On April 6th I got a further report that in the morning's milk the fat was down to 2·80, and the total solids were 11·77; in the afternoon of that day the fat was 4·20, and the total solids 12·98. Of course that gave an average on the two milkings of 3·50 of fat and 12·38 of total solids. On May 11th—the cows had then been out to grass for two or three hours each morning—the fat had risen in the morning to 3·16, and the total solids to 12·24. I have not the analysis of the afternoon's milk of that day. Then I had no further complaint again; in fact I have had no further complaint, but the chemist of the dairy company allowed me to look at his book, and I have taken out a few monthly statements of the results of the tests of the milk of my own cows at different periods during 1899. The first is on January 5th, the fat in the morning then was 3·30, and the total solids 11·84; in the afternoon of that day the fat was 4·45, the total solids 13·08. Then on February 8th the fat was down to 3·20 in the morning and 4·60 in the afternoon. On March 16th in the morning it was down to 3·10, and in the afternoon it was 4·60. In June in the morning the fat was 3·50, and in the afternoon 4·56. In August the fat was down again to 3·15 in the morning, but it was 4·65 in the afternoon.

2285. You have not April of that year?—I have not April of that year; I presume that April would probably be a little lower than March, according to my general experience. In September in the morning the fat was 3·60, and in the afternoon 4·85, and in November it was 3·15 in the morning, and 4·65 in the afternoon. Those are the latest figures I have for my own cows. Just to give a little corroboration of and to show that it is not an experience peculiar to me, I may say that in the book that I took these from, most of the farmers in my district that were sending milk to the same company had figures which to some extent very considerably corroborated the figures that I have given you—but they were not quite the same.

2286. (*Mr. Cowan.*) What is the extent of your herd?—This is just 40 cows that I am speaking to. One of my neighbours in an adjoining parish had had a complaint from his customer, and he sent in a sample of morning's and afternoon's milk to another chemist, the chemist of the borough where he sends his milk to. His morning's milk gave 2·87 of fat, and his afternoon's milk gave 4·70 of fat. I will just put in one other set of figures from a herd of cows I know; it is a home-farm dairy in Yorkshire, where the cows are very well done. They are a mixed herd of cross-breds, and several breeds. They were out at grass and getting cake in addition. There the morning's fat was 3·50, the evening's fat—because there was not such a wide difference between the two milking times—was 5·20. There the conditions were more normal; they are still, perhaps, not quite equal periods, but very much more equal than in my case. I took out some figures from what is reported in connection with the milking prize at the Royal Show at Birmingham in 1898; I do not know whether I understood yesterday that you declined to take any figures carried on away from home.

2287. (*Chairman.*) We thought it rather introducing a new element not really typical of the life of the cow in the country, and we had better keep to the life of the cow?—You might allow me to mention a single cow—I will not quote all the figures—it is a cow that was ultimately awarded the first prize as a milk and butter cow. Her morning's milk—Dr. Voelcker will, perhaps, correct me if I am wrong—I think showed 2·25 of fat, and it was 4·50 in the afternoon; and there the periods were fairly equal. I could give several more results of trials of cows at the Dairy Show that came under my own observation where there is quite as much variation as those I have given from my own herd; I could have given lots more, but I thought I would only put in the figures which I could absolutely speak to myself where the milk was produced under my own eyes, and where the mixing was done under my own observation, and where I was quite certain of the samples being taken properly.

2288. (*Professor Thorpe.*) With respect to that particular point I think if you were in our position, having to come to a decision, you would not have regard to milk taken under the particular conditions of which you are speaking, which are exceptional, and really ought not to be taken into consideration, as they do not represent the conditions under which the consumer gets his milk?—I do not press those figures, because there may be circum-

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stances involved which do upset the accuracy of the results.

2289. (*Chairman.*) Have you any other points you wish to bring to the notice of the Committee?—Later on, if you ask me I shall suggest a standard, and I shall do so on the understanding that in the case of any milk falling short of that standard it is only fair to assume that the milk may be genuine, but that the onus of proof that the milk is genuine shall lie upon the person in whose possession the milk is found, either the producer or the vendor. I would not attempt to fix a standard if the producer of a milk was necessarily penalised for being under it. I have raised my standard a little because I assume the presumption shall be that the milk may be genuine, and it is still open to the producer to prove that it is genuine, in which case no conviction would lie, I take it. I wish to speak to a case in which I was concerned, in which I think it is scarcely fair to take the assumption that if a milk has fallen below a certain standard, that milk has been adulterated. I was asked to give evidence in a case rather more than twelve months ago, where the report of the county analyst was that the sample on which the summons was issued showed that the total solids were 12·36, and the fat was 4·84, the other solids being abnormally low—they were only 7·52. The analyst's certificate was that that milk was adulterated with at least 11 per cent. of added water. I do not know that I should have gone into the box to give evidence in a case of that sort had I not been assured by the defence that it was a genuine milk. The farmer for his own protection had had a sample taken by an independent chemist, who assured me that in the sample that he took from the cows about the same time, the other solids were even lower than that on which the summons was issued. Then the other solids were down to 7·34, though the fat was not so high—the fat was only 4·38, and the total solids were below 12 per cent. then. A good deal of evidence was given, and the case was adjourned as the magistrates could not decide. It was ultimately decided that the two chemists, the one for the prosecution and the one for the defence, should jointly inspect the herd, and have samples taken in their own presence. I think the farmer had not been feeding the cows on a very rational plan, and at the suggestion of his chemist he had in the meantime made some alterations in their food which had slightly altered the milk. The analysis of this sample given by the chemist for the defence, which I understand very nearly corresponded with the one for the prosecution, showed that the fat then was down to 4·14, and the other solids were raised to 8·14. There was no conviction, but the farmer was put to a very considerable expense in defending himself. I think the assumption that "this milk is adulterated with 11 per cent. of added water" in the case of the total solids being so high with such a high percentage of fat, is very unfair to the producer.

2290. That is the inference, I believe, that most analysts would draw in the case of the solids not fat being so low?—Unfortunately they cannot judge whether it is due to added water or whether it is naturally poor milk; that is where the unfortunate part of the business comes in.

2291. You were telling us that you were going to suggest a standard?—Yes. In the face of these figures I cannot recommend a higher standard than 11·50 of total solids, of which not less than 3 per cent. should be fat. If there is any milk coming short of that standard then I think it is incumbent upon the producer of that milk to prove to the satisfaction of the authority that it is genuine milk.

2292. And you say that, in face of the fact that if these figures were adopted as the law of the land you yourself would be called upon to show several times in the course of the year that your milk was really genuine?—I am afraid I must say that; to adopt any lower standard would have no effect in any way.

2293. But still the adoption of that standard would render you liable to be called upon?—It would render me liable to show that the milk was genuine; if it was to render me liable to prosecution I would not recommend such a standard. But I think there is no reason why I should not be called upon to prove the milk is genuine if it falls short of that.

2294. You say that, as a producer yourself on a large scale?—I say that, as a milk producer.

2295. Have you any other points that you wish to bring to the notice of the Committee?—This suggestion of 3 per cent. of fat is assuming that the producer has a right to insist upon an appeal to the cow—not that it shall be in the option of the justice whom he may be called upon to appear before—that he must have an absolute right to that appeal. I do not say it would always help the farmer, because in a very few days from a difference in the weather, or the temperature, there may be a variation in the analysis of the milk which might help to condemn the man appealing; but I see no other course open unless two standards could be adopted which would be very difficult indeed, one for the morning's milk, and one for the afternoon's milk. I scarcely like to put the two standards forward as a suggestion.

2296. It would be very difficult to work?—There are obvious difficulties in the way.

2297. (*Professor Thorpe.*) I presume it would be open to the farmer to show when he was on his defence at what period of the day the milking was taken?—Yes.

2298. If it happened to be the morning's milk he could show that?—Yes. But so far as my experience of these cases has been the justices who hear the case attach no importance to that statement; they do not understand there is any variation; they have been taught by chemists that there cannot be very much variation, and consequently they attach very little importance indeed to that statement.

2299. I think it is rather a question of degree; I think it is generally understood there is a difference, but where the disparity arises is as to the amount?—I have heard the other upheld. I think perhaps chemists are rather coming round to the opinion now that there is that disparity to some extent.

2300. (*Chairman.*) The figures you quoted have shown a larger disparity, I think, than any we have had before us yet?—They are very striking. Then means should be taken to ensure milk not being tampered with in transit. In my case, where it is driven direct to the town by my own cart, of course there is no danger of that. But when milks are out of the control of the farmer it does seem hard that he should be responsible for an article over which he has had no control, for perhaps six or eight or ten hours, and the conditions of which he has no possible means of guarding against.

2301. What do you suggest that the law should prescribe?—I think, at any rate, the producer if he wished might be allowed to have his cans locked. I am told that the railway companies object to that because they like to ascertain the quantity of milk they are carrying. A very simple method to obviate that difficulty would be to have the tare of the churn stamped upon it, and to put it on the weighing machine; that would be quite as easy as taking the lid off the churn, and examining how many gallons of milk there were in it. The only reason I have heard why the railway companies object to allowing churns of milk to be locked is that they then cannot ascertain the contents. The farmer can protect himself by means of a locked churn if he cares to do so.

2302. That is a matter more between the parties concerned than, I should say, for the law to interfere with?—I think if a farmer wishes to protect himself that way he should have a right to do so. At present he cannot do it. The railway companies have a free-hand there, and I am told they will not allow it to be done.

2303. (*Major Craigie.*) Are you aware that the railway companies state that that is perfectly allowable now?—There is an official correspondence which took place while the Bill was before Parliament, in which it was stated that they had no objection whatever—in fact, it was their rule that churns might be locked?—I was not aware that they had given permission. I know that on several occasions they have contended that they did not prevent it, but I had never been assured that they did give permission to do it.

2304. I understand that the point was this, that they reserve the right in any suspicious case known to themselves to call for the churn to be opened, but that the rule was that the milk might be conveyed in locked churns, and that that is not only the customary rule but the practice in several railway companies—as has been, I think, lately stated in evidence before this Committee?—I did not understand that.

2305. (*Mr. Cowan.*) So far as the producer is concerned, would you get over that difficulty by making the place of delivery the point at which the farmer's responsibility ended?—Yes, the place of delivery to the railway companies when it goes out of the control of the farmer's servant. That is what I should like to see done, but what I am afraid of is that you could not get the dairy

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companies to fall in with that suggestion. They would say we cannot accept delivery in that way, and then who is to have the responsibility while it is in transit?—Certainly that would be much the most sensible that the farmer should cease to have any responsibility when it gets out of his control.

2306. (*Professor Thorpe.*) Over what line do you send your milk?—I do not send by rail at all. The North-Eastern serves the district that I live in.

2307. Has the North-Eastern specifically objected to allow you to lock the churns?—I could not say whether they have ever declined or not. The question has not concerned me personally, so that I have not really gone into it.

2308. Has not your Association taken any action to request the company to allow you to lock the churns?—The Central and Associated Chambers of Agriculture, I think passed an abstract resolution some time ago on the question, but it has not been before them lately.

2309. Do you apprehend there would be any difficulty on the part of the companies if you moved them to allow you that right?—I am not sure that all farmers would avail themselves of it, even if they had that right. I certainly would much prefer the other suggestion that the farmer's responsibility ceased as soon as he put the milk on the rail.

2310. (*Chairman.*) Have you any other point you wish to bring before us?—No, I think there is nothing further.

2311. (*Professor Thorpe.*) Is it your practice to cool your milk?—No, it has to be sold warm.

2312. Do you find any practical difficulty in carrying out the method of mixture which you described?—None whatever. Many of my neighbours have adopted it, as they see that it works well. It is simple in practice with me, and it obviates the complaints that you may have from time to time of the variance in the quality of one consignment. I contend very strongly that where the practice is to put the milk direct from the cows into the churn quite possibly you might have five or six naturally poor cows standing together, and one churn might contain the milk of those cows which would be very much below the average of that consignment of milk.

2313. Then your experience and that of your friends who have adopted this system is that there is no practical inconvenience in carrying that out?—None whatever.

2314. Were those cows that you weeded out of any special breed?—No, they were most of them ordinary Yorkshire cows—unpedigreed Shorthorns.

2315. There was nothing in the breed which occasioned you to weed them out?—Nothing.

2316. The analyses that you have mentioned to us were made, I presume, by some gentleman employed by you as a body or individually?—By the chemist of a Dairy Company, of which I am a director, and of which I know the working. My milk goes to that same company.

2317. He is a gentleman employed by the company?—Yes: he is employed solely for the purpose of testing the milk. It is a very large company. They buy a very large quantity of milk, and there is full work for a chemist in testing the milk received from the different farmers.

2318. I meant rather that he is not a public official?—He is not; he has been an assistant, and he qualified under a public official. I may say also that his analyses whenever there has been any other test against them have always been found to be very accurate; they have never been proved to be wrong by comparisons with other tests of the same samples.

2319. (*Dr. Voelcker.*) I take it that while the general body whom you represent were in favour of a standard of 12 per cent. of total solids, of which 3 per cent. should be fat, you are of opinion that if you had put your proposal rather as 11·5 of total solids with a minimum of 3 per cent. of fat, you would have commanded rather larger acquiescence?—I know that two or three more would have supported my amendment.

2320. But the fact of your mentioning 2·75 of fat appeared to make a rather too low standard?—I took that view of it.

2321. So that in the opinion of the general body 3 per cent. of fat would be not excessive?—The majority, 21 out of 36, I think were of that opinion.

2322. With regard to the use of cream tubes, of course you know that that is very uncertain?—It is a rough-and-ready means of ascertaining.

2323. And nothing more than that?—No. It gives some indication of the quality of the milk.

2324. When you speak of the great disparity between the morning's and evening's milk that opinion is based more upon the analysis made of your own cows than upon anything else?—And the other results I see; I know that all my neighbours have the same results.

2325. In regard to the opinions of chemists that you have spoken of, are you referring to the opinions of public analysts, for instance?—Some of them are public analysts.

2326. You are aware, of course, that they know very little about the history of the samples that they take?—They generally complain that they do not; a sample is sent to them, and they know nothing of its history.

2327. You say that to a certain extent you can remedy the natural variations?—I do not admit that. I think I said I could make no appreciable difference by any change I could make in the feed.

2328. I thought you told us that by taking some of the heavy milkers first in the morning, and then later on at night you did remedy the natural variations?—Not to make any appreciable difference in the variation of the milk. The object is to milk those giving the most milk at more equal periods. You can make two or three hours' difference in that way instead of having two intervals of 16 hours and 8 hours respectively. It would make a slight difference also in the quality of the milk.

2329. That is what I mean?—Naturally it would do that.

2330. A man who knows what his cows are yielding is able in a certain way to check operations of that kind?—When I have done all this, these figures still come out; if I had not done that there would have been a greater disparity still.

2331. You told us that you had some Guernsey cows?—Yes.

2332. Those, I suppose, are for butter making?—The milk is kept separate.

2333. May I ask what you do with the milk?—I sell it as a special milk.

2334. Not for butter making?—No, it is sold as a special milk.

2335. You do not put the milk of the Guernsey cows along with the milk of the 40 Shorthorns?—No.

2336. Of course if you did you could make the quality of the milk beyond any doubt?—Yes; I do not do it for this reason; the average of my morning's and afternoon's milk is always higher than any standard that will ever be fixed, and I do not see why I should give the consumer the benefit of my Guernsey milk in addition to that.

2337. You mean to say as long as you keep to the mark?—I like to be over the mark.

2338. As long as you keep on the safe side of the mark that will be fixed you don't think that it is right the farmer should be called upon to improve the quality by the addition of extra cows of a special breed?—No. The consumer does not take that into consideration when he buys it, and he is not entitled to it.

2339. In regard to the Guernsey cows that you speak of as giving a special milk, do the people who get it know they get an extra quality?—They pay an extra price; they pay a penny a quart more for it.

2340. Would you advocate in consequence of that any grading of milk according to its quality?—I do not think it is practicable. I may say that some years ago the manager of my dairy company offered to buy his milk on those terms of paying the farmers higher prices for higher qualities on the basis of a percentage for every additional quarter per cent. of fat, but none of them would sell their milk on those terms.

2341. Could you tell us if the morning's and evening's milks which are sent by you are kept separate by the company to whom you send them and are retailed separately?—They go into consumption immediately. The men with their barrows are waiting and take it out immediately my cart arrives and it is all distributed before the next milk comes in.

2342. So that you may say that what has been sent in by you as morning milk is distributed to the public as morning milk?—Entirely.

2343. The public gets, then, your full morning's supply without the addition of the evening's milk of that day or the previous evening's milk?—That is so. In most cases it would be quite impracticable to keep and mix the morning's and afternoon's milks together.

2344. But despite the variations you have had no practical difficulties; you have not been subjected to prosecution or anything of that kind from the supposed

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existence of a standard of 3 per cent.?—I suppose I have been rather lucky never to have had an official sample taken at an unfortunate time of the year.

2345. From your experience, having had a big herd of milking cows and so on, you would not think it at all unfair that if a standard of 3 per cent. of fat was not reached the presumption should be raised that there was something affording a basis for inquiry?—I think milk falling below that standard ought to be the subject of inquiry.

2346. You agree that to a certain extent the quality of milk can be improved by the feeding of the cows?—To a very slight extent.

2347. Perhaps the extent has been somewhat exaggerated?—I should say my experience goes to prove that. I must say though on that point that I am starting with highly-fed cows. It is possible that with cows which are very poorly fed, the addition of rich food would alter the composition of their milk; but taking well-fed cows to begin with you can have very little effect upon them then.

2348. I quite agree with you there. You told us that some of your cows you weeded out in consequence of the low results that were given by individuals?—I have the test of each cow here, and they varied from about 1.5 per cent. of fat to about 6 per cent., I think that was the variation; I did not immediately sell them, but they were fed off or got rid of somehow.

2349. Would you consider it any hardship that a farmer should be expected to weed out cows that did not give good results?—Yes, I should. It is an unfair thing that a farmer should have to sell off—in some cases it might be—a large proportion of his herd. Getting rid of your cows entails a considerable loss on each cow sold.

2350. But you know that in regard to some of the heaviest milking cows one great virtue of them from a milk seller's point of view is that they give an enormous quantity, although it is often at the expense of the quality?—My tests do not show altogether that it is the cows which are giving the largest quantity which are giving the poorest milk.

2351. Still, these you were weeding out were not giving a good percentage of fat?—No, and some of them were not giving a large quantity of milk.

2352. May I turn to the consumers' point of view? Might not the consumers very well ask that they should be supplied with milk from cows that gave a good percentage of fat?—My contention is that with no well-kept, well-fed cows will you find the average of their morning's and afternoon's milk together fall short of 3 per cent. It ought to be a give and take business, if the consumer gets rather less in the morning he gets extra in the afternoon.

2353. If you have got a notoriously deep-milking cow, would not your suspicions be rather aroused that the percentage of fat that she would give would not be particularly high?—When I have made individual tests that has not been my experience altogether; in fact there is no preponderance in that way in any individual tests I have made.

2354. With regard to any complaints you have had, those complaints, taking the year 1890, seem to have occurred in April?—Yes.

2355. Can you give any reason for the complaints being greatest at that time?—I do not know why it was. My experience is that it is in the spring months when I have the greatest difficulty, and when my milk is the poorest always—from February to April.

2356. At that time the cows are where—in the sheds?—In the sheds altogether.

2357. Is there any difference in their feeding from the earlier part of the winter?—Scarcely. I very seldom use mangolds alone; I do occasionally have to use a few mangolds in the place of swedes in the last spring month or two, but I think not more than once or twice in the last seven or eight years.

2358. The mangolds are not better than swedes?—If I substitute mangolds altogether for swedes in my cows' rations, within a week I have a very saucy message back from the dairy that I must change the feed.

2359. It depends where the mangolds are grown, does it not?—I grow the best quality—the best coloured mangolds, the golden-fleshed mangolds, but I dare not use mangolds alone without some swedes.

2360. Your part of the country is not an excellent mangold-growing part, is it?—I grow a very good quality of mangolds.

2361. In your feed for these cows, what do you rely upon mainly for quantity; do you give brewers' grains, for instance?—No, I never use them.

2362. Do you feed roots?—I give a liberal allowance of roots pulped and mixed with chaff.

2363. The tendency of that is of course to give quantity and not quality?—To give quantity along with quality. All the most reliable tests I have seen between feeding with swedes and not with swedes show that where a certain amount of swedes were used the milk was rather richer than where there were no roots given.

2364. You do not use anything else of a succulent nature besides roots?—Except the meal and cake are all mixed into a mash—but of course that does not alter them.

2365. Can you give any explanation of the fact that in 1899 your returns, even in the months when the quality of the milk was at its lowest, are so much better than they were in 1890 and 1894?—I take it that 1894 was an abnormal year. I have spoken to several of my neighbours, and they found an equal difficulty in that year which they could not explain in any way.

2366. In 1899 there is not a single figure that you have given us which is below 3 per cent.?—I have no reason to know, except on one occasion in 1896, or 1897, that I have ever fallen below the 3 per cent. of fat. I have had no complaint.

2367. You had no different class of cow in 1899?—No, they were practically the same.

2368. You did not feed them differently?—No. I have not made any essential change for the last fifteen years in my feeding.

2369. But August and September of 1899 were not very favourable months from a dairyman's point of view, were they?—I was using a large quantity of bought food, and in September I began to give them roots on the grass.

2370. We have had a good deal of evidence showing that in times of drought, and so on, there would be a considerable difficulty, but you appear in those times not to have had any difficulty in getting the milk up to 3 per cent.?—In August, 1899, I fell below my usual standard for that milk considerably.

2371. But it is still over 3 per cent.?—It is 3·15; I think that rather low for summer.

2372. In September it is 3·60?—Yes, August was our worst month; they were getting roots in September—turnips.

2373. All through 1899 you were well above 3 per cent.?—I was never below it.

2374. Do you find, as a matter of fact, that you get the best quality of milk when you turn the cows out to grass first?—By June we do.

2375. But not certainly at the first?—Always the fat goes up a little compared with what it has been in the spring months, when it is lowest. In June and July we get the best results.

2376. These different analyses were all made by the same person, were they not?—Practically.

2377. Both those done for you and those figures that you had access to?—All with one or two exceptions.

2378. And he is not a public analyst?—He is not.

2379. It is not the gentleman at Dundee that we heard about yesterday?—No, it is not.

2380. You hold, I believe, pretty strong views about the transit of milk?—I think it is unfair that a farmer should have responsibility where he has no control.

2381. I think I am right in saying that the contention on behalf of the railway companies has been that inasmuch as they have to carry a certain quality of milk at a certain rate they must have the cans unlocked in order to see that that quantity is there?—They say so.

2382. Is that not open to the obvious objection that there is nothing to prevent a man, say a porter, at a station taking milk out and putting water in the can to make it up to the mark in regard to quantity?—I am quite certain it is very often done.

2383. You have told Professor Thorpe that it is not your habit to refrigerate milk; what do you do in hot weather; do you never refrigerate then?—No, because it is sold immediately.

2384. You have no difficulty then with regard to the milk not keeping?—No.

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2385. We have been told with regard to the mixing of the milk that the ordinary farmer would not do it, but that a churn may very well hold the produce of four or five inferior cows, and the farmer may be subject to difficulty on account of that milk being sampled, whereas it would not represent the produce of his herd generally; you tell us on the other hand that the mixing of the milk is quite an easy matter?—In my case it is, and I see that many of my neighbours have adopted it. I see no reason why farmers should not.

2386. Do you think it is any hardship upon the farmer from the consumer's point of view that he should be made to do this if he wishes to secure himself?—It is in his own interest to do so.

2387. Do you think it is desirable that a standard should be fixed on the basis of milk so mixed as to represent the general produce of the herd, or that it should be fixed on a standard based upon the analysis of the milk of four or five, possibly inferior cows?—Of course, there are a very great number of producers who only have four or five cows, and it would be obviously unfair to them that they should be under a disadvantage which a large producer is not under.

2388. Still you would not consider it quite consistent with trade competition, and so forth, that you should have to go against a man who has four or five inferior cows, and nothing else?—I should not legislate for single cows.

2389. (*Mr. Cowan.*) You say it would be quite practicable for the farmer to mix his milk in the morning?—That is where it goes away at once. I would not say so if it has to be cooled; I think then there would be a difficulty if it had to be all refrigerated, because the refrigeration must go on during the whole process of milking. I am only speaking of when it is sent away by road, and when it is not refrigerated.

2390. Farmers living at a distance from a large city have to refrigerate their milk, have they not?—In that case there would be a difficulty in mixing the milk before refrigeration.

2391. It would be thoroughly impracticable with a large dairy, would it not?—I suppose it would take up so much time before the milk could get away.

2392. (*Mr. Barham.*) This chemist who has been referred to as not being a public chemist, I suppose occupies the same position for this large company that you speak of as Mr. Richmond does for the Aylesbury Dairy Company?—I should say so.

2393. And his experience, I presume—I will not say it is as large—is almost as large as Mr. Richmond's—his experience is very large at all events?—I should say he makes at least 10,000 analyses every year for my company.

2394. You have no reason whatever to doubt his report?—His figures have never been called in question.

2395. It is the same man that finds the small percentage of butter fat in the morning's milk that discovers the large percentage in the afternoon's milk?—Yes, that is so.

2396. You have referred to the desirability of the honest producer having what we may term a loop-hole of escape in the event of his milk being below the standard; you have also said that a friend of yours in order to prove his innocence, or in order to prove that his milk was pure was put to a very considerable expense in contesting a case with a public authority?—If I may I should like to go a little further there. I say it was very unfair that the man should be put to that expense, and that any prosecution should ever arise on such an analysis as his milk showed. I think it was a great miscarriage of justice when he was not awarded his costs.

2397. I daresay you know of other cases of the kind where a man has proved his innocence and then has not been awarded costs?—Yes, many cases.

2398. As a rule it is not usual for the magistrates to give costs against a public authority, is it?—So far as I am aware they never do give costs against a public authority. I am not sure myself that I from the bench could award costs against public analysts. I am not sure whether they are not protected or privileged to some extent. But, however strongly I may feel I do not know whether I would run the risk of having my verdict appealed against.

2399. (*Professor Thorpe.*) It is not costs against the public analyst; it is costs against the public authority?—Yes. The presumption is that they have a protection; I know that is the general feeling on the bench.

2400. You mean that the general feeling of the bench is that the authority was justified in raising the case?—Yes, but I maintain that in this case that I referred to they were not justified in any way. I say it was a scandal, a disgrace, that any prosecution should have arisen on such a sample.

2401. (*Chairman.*) However, the Bench did not take that view, and we really cannot get at the back of the mind of the particular Bench on that occasion?—No, we cannot.

2402. (*Mr. Murphy.*) Can you tell me whether the difference between the morning's and afternoon's milks is more marked in the case of young cows, or in the case of old cows?—My cows are of all ages from their second calf to their sixth or seventh. I buy all my cows, and I buy young cows and keep them for two or three years, so that they are cows of all ages. I could not answer that question off hand. I keep off extreme old age.

2403. (*Dr. Voelcker.*) When you say you do not advocate the fixing of a minimum percentage of non-fatty solids, I suppose you have no very special grounds for that opinion?—My experience is that the non-fatty solids are liable to more variation even than the fat. I can remember a time when chemists would not admit there was any variation. I understood that they were always fixed with regard to the non-fatty solids, but my experience goes to show that there is even greater variation in them. I take this view—that if the consumer gets the full amount of total solids to which he is entitled, and the full amount of the most valuable of those solids, he is not prejudiced if he loses a little of the other.

2404. So you prefer a statement of the total solids to a division?—It is not quite such a hard and fast rule, and I think it would be less liable to abuse.

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Sir CHARLES A. CAMERON, C.B., M.D., called; and Examined.

2405. (*Chairman.*) You are, I believe, public analyst for the City of Dublin?—Yes I have been public analyst for the City of Dublin since 1862.

2406. And also for different counties in Ireland?—Yes, for a great number.

2407. And you have had 30 years' experience of the chemical examination of milk?—Yes, at least 30 years.

2408. You are a lecturer on Chemistry and Geology in the Government Agricultural Institution at Glasnevin?—I am.

2409. You have had there the opportunity of obtaining samples of milk of undoubted purity, which would represent the whole milk of the cow?—Yes.

2410. In 1880—that is, 20 years ago nearly—you analysed the milk of 42 cows?—Yes.

2411. Would you tell us what the result of your examinations was?—I may say that I made this investigation for the purpose of satisfying myself as to what ought to be a proper standard to take in regard to milk. Early in the year 1863 I adopted a standard myself of 12 per cent. of total solids, regardless of the non-fatty or fatty constituents, and I still think that if I had maintained that standard up to the present time it would not have been very far astray. On that standard hundreds of convictions for the sale of alleged adulterated milk were obtained in Dublin, and in no instance was the standard ever questioned by the persons who were convicted. As I have said, twenty years ago I made an investigation in reference to the milk yielded by 42 cows at Glasnevin. These cows were all well fed cows, and they were kept in the house, it being in the winter season towards the very end of 1880. There were some observations made with regard to the influence of age upon the quality of milk, and also the difference, if any, between the milk yielded in the morning and that yielded in the evening, the results of which I have already given in a paper which was published in the proceedings of the Royal Dublin Society 20 years ago (Vol. III., part 3). It will be found that the ages of the cows ranged from four years to nine years inclusive. If we take the two groups (first) those aged four years and five years, and (second) those aged eight years and nine years, we shall find a great difference in favour of the milk of the latter, both in quantity and quality. The eighteen cows composing the first group were on the average giving milk during three months; the average yield from each cow was $9\frac{3}{4}$ quarts; their morning's milk contained on the average 12·97 per cent. of solid matter, and their evening's milk 13·58 per cent. of solid matter. On the other hand, twelve cows aged eight years and nine years, inclusive, on the average, in their fifth month of lactation yielded 10 4-5 quarts of milk daily, containing in the morning 13·39 per cent. of solid matter, and in the evening 13·96 per cent. The richest specimen of milk save one was yielded by a cow eight years old, and in the tenth month of lactation; she only, however, gave six quarts of milk the day on which a specimen of it was taken for analysis. There were only four cows aged four years, and the average composition of their milk was, solids 12·245 per cent. and water 87·755 per cent. Their average yield was 11¼ quarts. It is hardly pertinent perhaps to this inquiry, but there were some results obtained from these experiments, which show the influence of the period of lactation on the quality of the milk. The belief that milk becomes deteriorated in quality towards the end of lactation, is not supported by the results obtained by these experiments, so far as they go. Eleven of the 42 cows were giving milk from eight to ten months, the average yield of their milk was 6 4-5 quarts, which was much below the average yield of all the 42 cows. The total solid matter in their morning's milk was 13·57 per cent., and in their evening's milk 13·96 per cent. At an advanced period of lactation milk becomes scanty in quantity, but the quality—at least as shown in the cases of the 11 cows in question—becomes on the whole improved. Six cows were giving milk for periods less than one month. They yielded 13 quarts daily each on the average. The solid matters in their morning's milk were 12·70 per cent., and in their evening's milk 13·21 per cent. Eleven of the cows were giving milk from one to two months. One reason why I made this investigation was that excuses are often made in Ireland as to the cows giving bad milk when they were nearly exhausted—when the period of lactation was coming to a conclusion. That was the reason why these special observations were made as to the influence of the period of lactation on the quality of the milk. The eleven cows that were giving good milk furnished on the average 11½ quarts per diem. The solid matters in their morning's milk amounted to 13·46 per cent., and in their evening's milk to 14·12 per cent.—in every case every individual cow's evening's milk being superior to the morning's milk. Five of the cows were giving milk for four months. Their yield was, on the average 10½ quarts daily. The total solids in the morning's milk amounted to 12·196 per cent., and in the evening's milk to 13·456. Then I have the following table, which shows the quality of the milk as affected by lactation, dividing it into four periods:—

Cows giving milk	Quarts yielded per day.	Per cent. of solids in morning's milk.	Per cent. of solids in evening's milk.
Less than one month - -	13	12·700	13·210
During from one to two months	11½	13·460	14·120
During four months - - -	10½	12·196	13·456
During eight to ten months inclusive.	6⅘	13·570	13·960

Then in my paper I gave the difference between the quantities yielded in the morning and in the evening. In every instance the quantity of milk yielded in the morning exceeded the proportion furnished in the evening. In two instances the morning's supply was three times more abundant, and in very many cases twice as plentiful. About eight hours intervened between the milkings. Then in regard to the superiority of the milk obtained in the evening I may briefly say that the average amount of the solids in the morning's milk of the whole 42 cows was 13·20, and in the evening's 13·74—a difference of 0·54 per cent. The increase in the amount of solid matters in the evening's milk was due chiefly to the larger amount of fats contained in the latter. The amount was 4·22, or 0·4 per cent. over the proportion (3·82 per cent.) found in the morning's milk. In the case of the mixed milk of 42 cows that yielded in the evening was richer by 0·56 of solid matters, including 0·44 per cent. of fats. The results of the analyses of the milk of these 42 cows show that the milk of well-fed cows in houses in the last quarter of the year contains, when poorest, that is, in the morning, 13·90 per cent. of solid matter, including 4·20 per cent. of fats. I may say that the utmost accuracy characterised these experiments. The cows were milked to absolute dryness. In Ireland there is a little dodge of selling what is called fore milk, and withholding the strippings, so that the strippings might be made use of in the production of butter or sold as cream. It is a common thing to supply the workhouses with the fore milk of the cows. There have been many convictions obtained in Ireland for selling that fore milk as whole milk. On the 2nd November the mixed milk of eight cows which happened to be in the same house was analysed. One hundred parts contained of total solids 13·9, of solids minus fats 9·75, fats 4·15, and ash 0·72. At that time the Society of Public Analysts of Great Britain and Ireland adopted as a standard for the poorest pure milks 9 per cent. of solids minus fats and 2·5 per cent. of fats—a total of 11·5 per cent. of solids. There is little doubt that milk containing less than 11·5 per cent. of solids is watered or skimmed.

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2412. What period may I ask are you alluding to?—1880; twenty years ago.

2413. That was the standard of the Society of Public Analysts at that time?—Yes, at that time.

2414. Since then, I understand, it has been altered?—Yes. I do not know whether it was altered on the suggestion contained in my paper, but still it has been altered. The results of the analyses of the milk of the Glasnevin cows prove that the milk of an individual cow may contain less than 9 per cent. of solids minus fats. In 25 instances the solids minus fats are less than 9 per cent. So far as house fed cattle in Ireland are concerned, 9 per cent. of solids minus fats should be reduced to 8·5 per cent.—at that time the standard was 9. At the same time, if the milk be the mixed product of several cows, say eight and upwards, then 9 per cent. would be a fair proportion to expect. In the mixed milk (morning's) of the 42 cows the solid matter minus fats was 0·7 per cent. above the standard figure 9—that is, was 9·7—whilst the average of the 42 analyses of the morning's milk gave only an excess of 0·38 per cent. above the standard proportion—that is, the average of the 42 cows gave 9·38 per cent. of non-fatty solids. With respect to the amount of fats, I said, speaking in 1880, that 2·5 per cent. was rather low, and that I was disposed to believe it should be raised to 2·75, which was subsequently done, but not for a considerable time afterwards. In the morning's milk the maximal amount of fat was 5·40 per cent., and the minimal proportion was 2·88. In the evening's milk the maximal amount was 6·30 per cent. and the minimal 2·69 per cent. The average percentage of fat in the mixed milk of the 42 cows was 4·20 in the morning's and 4·62 in the evening's. Thus it will be seen that whilst in 25 instances the solids minus fats fell below the Society's standard, in no instance did the fats fall so low as the Society's standard. The percentage of total solid matter in the morning's milk varied from 15·50 in the case of the cow No. 17 to 11·44 in that of cow No. 38; and in the evening's milk from 16·80 (cow No. 36) to 11·50 (cow No. 9). The percentage of solids minus fats varied in the morning's milk from 11·78 to 8·25, and in the evening's milk from 11·30 to 8·27. The suggestion has often been made that a standard for milk should be defined by statute. I suggested 20 years ago that there ought to be a standard. I said then that perhaps it would be advisable to institute two standards. One might be for solids minus fats 8·5, and for fats 2·7 per cent. Any person selling milk below this quality should not be entitled to any defence on the ground of the natural poverty of the milk—he might upon the ground of the inaccuracy of the analysis. I still adhere to that opinion, though it is 20 years old now. I also said 20 years ago that another, and general standard, might be solids minus fats 9 per cent.—fats 3 per cent. I am still of that opinion now, 20 years after I first expressed it. That was a standard I adopted, and upon which for nearly 15 years hundreds of convictions for adulteration of milk were obtained in Ireland upon my certificates. It would be open to persons charged with having sold milk below this standard to prove that it was procured from a very limited number of cows; or they might demand that the cows should be milked in the presence of a responsible person, and a sample of the milk so obtained analysed. A milk vendor, who was prosecuted for selling milk which I certified was adulterated, protested in court that it was pure, but that it was procured from four cows known to yield very poor milk. I suggested that the cows should be milked in presence of an officer of the court, and the milk analysed. I found that it contained 13·20 per cent. of solids, including 3·5 per cent. of fats. The milk was also analysed by the Inland Revenue chemist, Somerset House, and with identical results. They further stated that it would be necessary to add 22 per cent. of water to it in order to reduce the amount of solids, minus fats, in it to that present in the alleged adulterated sample, which was also analysed

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at Somerset House, and my results confirmed. I think there is the strongest proof that milk, on the average, contains more than 13 per cent. of solid matters. I am speaking only of Dublin. In my paper which I read in March, 1881, I also said "During the last 16 years I have examined an immense number of specimens of this liquid, and whenever I was certain that it was pure, I invariably found it to contain more than 12 per cent. of solids." Of course I have had thousands and thousands of milks, I should say, nearly running up now to 100,000 specimens of milk in my laboratory, and I am quite satisfied that the milk of Dublin dairy herds contains from 13 to 15 per cent. of solids. I have found from long continued experience of the milk of dairy cows in Dublin, especially when they are in the house in the winter, for the Dublin dairy cows are for about seven months in the year pastured outside the city, and for five or six months, according to the weather—whether it is prematurely cold or the summer sets in earlier than usual—they are in the city. During the time they are in the city the average quality of the milk is considerably better. When they are out in the country on the pastures the quality of the milk falls. Shall I give the method of analysis?—it would possess, I think, hardly any interest to the Committee.

2415. (*Dr. Voelcker.*) We should be very interested in hearing of it?—Ten grammes of the milk were kept in a shallow capsule—that is a quantity that I have ceased—15 years ago—to use. I now put only five grammes in the water bath at 212 degrees Fahrenheit until thoroughly desiccated. In some instances the drying process lasted two days. That was only just to see whether any great change took place in the sugar, which is converted almost into caramel, if kept for a very long time. The residue showed the amount of total solid matters. Ten grammes dried and pulverised were boiled in about 80 cubic centimetres of anhydrous ether for several hours, an upright condenser being placed over the flask containing the ether to prevent the waste of the latter. The ether containing the milk fats in solution was filtered, a very small piece of filtering paper being used, into a light tared flask. The ether was distilled off, and the last traces got rid of by passing a current of hot, dry air through the flask and condenser. The flask and its fatty contents were then weighed. The amount of the ash was determined by igniting at a low temperature in a platinum dish the residue obtained by evaporating ten grammes of the milk to dryness. I may mention that in every case duplicate experiments were made, that is, every specimen was examined twice. It is perhaps in part owing to the great care taken to extract every particle of the fat that such high percentages of that ingredient were obtained. In every instance the amount of solids was, as I say, determined by means of two independent experiments. Many of the weighings of the fats and ash were repeated. In the paper which I read before the Royal Dublin Society I inserted a table showing the composition of the milk, giving the water, the total solid matters, the solids minus fats, the fats, and the ash, in the case of each of the cows. There are 84 analyses given in this table, and in addition there is the analysis on a special occasion of the mixed milk of the cows. The average of the 84 specimens, 42 in the morning and 42 in the evening I shall read. The total solids in the morning's milk were 13·2, the non-fatty solids 9·38, the fats 3·82, and the ash 0·71. That represents the mean of the 42 analyses, but that of course does not represent the mean quality of the milk. In order to ascertain that, the mixed milk of the 42 cows was examined, and the results differed somewhat. The water amounted to 86·1, the total solids to 13·9, the solids minus fats to 9·7, and the fats to 4·2. Therefore the mixed milk of the 42 cows gave better results than the average of the analyses of the 42 milks—which, of course, we could understand, as showing that the good milk preponderated on the whole over the inferior. With the evening's milk we had still better results. The average of the 42 cows gave 86·26 of water, but the average of the mixed milk of the 42 cows only gave 85·54. The solid matters were 13·74 as the mean of the analyses, but as the actual result of the analysis of the mixed milk 14·46. The solids minus fats, in the first instance were 9·52, and in the mixed milk 9·82. The fats were 4·22 in the mean analysis and 4·64 in the mixed milk. Then the strippings were examined, and they gave, of course, very much better results. They gave in the morning 16 per cent. of total solids, including 6·42 of fats, and in the evening 16·65 of total solids, including 9·54 of non-fatty solids and 7·11 of fats. These experiments were all made with very excellent cows selected with great care for this government farm at Glasnevin. They were extremely well fed—they had as much food in fact as they could consume—so that these results only apply to cows that are kept under the most favourable conditions for the production of milk. The cows in my case were good animals of the Shorthorn breed, that had from one to three crosses. Very recently also I made some experiments at Glasnevin, but it was only the beginning of a series of experiments, with a view of determining the influence of various kinds of food, from an economical point of view, on the production of milk from the cows there.

2416. (*Chairman.*) When you speak of the economical point of view, do you mean cheap foods?—This experiment was merely made with the object of ascertaining the influence of food upon the production of milk having regard to the price of food.

2417. So it was a question of the cheapness of food. You gave them cheap foods, may I say?—Yes, different kinds of food. I may begin by saying that in order to ascertain the influence of food upon an animal I take it that the animal must be first in rather a poorish condition—an animal for example which is getting barely sufficient food to keep it in a good condition, which is hardly enough to do that, but still which is getting enough food not to produce any serious lesions. Thus the influence of food upon such an animal would be more easily ascertained. The results that I am now to place before the Committee are the results of analyses obtained with cows under-fed, and also at a time in which we find, at all events in regard to the Glasnevin cows, and generally with regard to the Dublin cows that the milk is poorer than usual—that is when they leave the warm houses, and are put out into the fields in the early spring. These cows were out in the early spring, and I have invariably found that the milk at the model farm—because I am always examining specimens of milk from the model farm at Glasnevin—is poorer in the spring than in the winter—considerably poorer. Therefore these results are very different from the results obtained 20 years ago; that is, the milk is not so good as a rule. I am sorry to say I have nothing left of my paper on those experiments but this tattered specimen. (*See Appendix No. IX.*) There was a time when I preserved all the papers I had to read with religious care, but lately I do not care so much about preserving them. These results have been published in one or two journals, and I have sent in a copy of a journal containing them. Those cows, then poorly fed, and out in the fields, were eight in number. In my paper I showed the weights of the cows, the quantity of milk they yielded, and the influence of certain foods upon them in groups of three, but I do not attach any importance to that. I may say at once that I do not put in this paper as showing the influence of food upon the animals, because it is only the beginning of a very long series of experiments, and the results are at present not such that I could deduce any conclusions from them. The mean composition of the milk of each of the eight cows taken during six days was as follows:—No. 10 cow (all the cows there have numbers) gave a mean on the six days' milk of 11·8 per cent. total solids, 8·9 of non-fatty solids, and 2·9 of fat in the morning; and in the evening 13·1 of total solids, 8·8 of non-fatty solids, and 4·3 of fat. In all these experiments with these cows there is a very remarkable difference between the amount of fat in the evening's milk and in the morning's milk. Another cow gave in the morning—to save time I will only read the non-fatty solids and the fats—9·3 per cent. non-fatty solids and 3·9 per cent. of fat; and in the evening 9·3 of non-fatty solids and 5·7 of fats—an enormous amount of fat in the evening; another cow in the morning gave 9·3 per cent. of non-fatty solids and 3·0 of fats, whilst in the evening it gave 9·0 of non-fatty solids and 5·3 of fats—an enormous amount. On the whole it is a curious thing that, although a much poorer milk was yielded in the morning, the non-fatty solids in the morning were actually more than in the evening, showing a substitution of fat for the albuminous matter in the evening milk. That is a point, I think, which might be taken into consideration in fixing the standards—the fact that even with the poor milk in the morning the 8·5 standard certainly cannot inflict an injustice upon anyone. The poor milk of the morning had over 9 per cent. of non-fatty solids. In only one instance, where it was just 8·9, did the mean of the non-fatty solids during six days sink below 9 per cent. We will take now the mean composition of the milk of the eight cows for six days—that is, morning and evening. That gives eight times six analyses in the morning and the same in the evening; and that gives us a fairly good average. In the morning the total solids were 12·1, the non-fatty solids 9·2, and the fats 2·9; in the evening 13·8 were the total solids, 9 the non-fatty solids, and 4·88 the fats. Therefore, the mixed milks of these cows, morning and evening, showed that the standard of 8·5 of non-fatty solids and 2·75 of fats held good. When we come to examine the milk of the individual cows, we find that the standard is not maintained. The milk of these cows, all placed under the same conditions, differed immensely in regard to the amount of fat, in some cases the fat being double what it was in other cases. I will just rapidly run down the figures for the non-fatty solids in the morning's milks of the individual cows:—10·1, 9·58, 9·4, 9·0, 9·1, 8·86, 10·1, 9·6, 9·4, 9·32, 9·2, 9·5, 9·1, 9·5, 9·3, 9·58, 9·28, 9·18, 9·46, 9·78, 9·68, 9·2, 8·9, 9·2. Then I will take the fats in the same way:—2·9, 2·2, 3·5, 2·5, 2·9, 3·0, 4·5, 3·5, 3·9, 3·2, 3·1, 2·8, 2·5, 2·7, 2·7, 2·6, 2·5, 2·5, 3·5, 3·2, 2·8, 2·4, 2·3, 2·2. (*See Appendix IX.*) The general results are these: The milk of individual cows sinks in the morning, as regards the fat, below 2·5 in a good many instances. In the forty-eight specimens of morning's milk, the non-fatty solids never were so low as 8·5, the minimal standard, whilst in eighteen of the specimens the fats were below the minimal standard of 2·75 per cent. In the forty-eight specimens of evening's milk the solids not fat never sank below the nominal standard, but in eighteen instances they were less than 9 per cent. It will be seen that, so far as these ninety-six specimens of milk were concerned, the standard of 8·5 of non-fatty solids holds good, but that the standard for fats fails in the case of the morning's milks. The morning's milk was rich in non-fatty solids and poor in fats, whilst the evening's milk was rather poor in non-fatty solids and very rich in fats. In some instances the percentage of fat was more than twice as large in the evening's milk as in the morning's. There were only eight hours' interval between the times of milkings. In Ireland they often say they have starved cows. I find that the results of the rather poor feeding was that the first effect was produced upon the weight of the animal and not upon the milk; the animal began to get thin, losing its weight, though there was not very much effect upon the quality of the milk. I may say that for a long time past I have never given a certificate that milk was adulterated when it contained 12 per cent. of total solids, no matter how small might be the proportion of non-fatty solids. I have sent in to the Secretary the composition of a milk which I had from the Belfast Workhouse the other day. That showed non-fatty solids 7·62 and fats 5·10, giving a total of solid matters of 12·72. I occasionally get a sample of milk of that kind, and I never give a certificate of adulteration. I have had samples of milk on which, judged by the standard of 8·5 per cent., I would have to give a certificate of containing from 10 to 20 per cent. of added water, but I never do it, as I think when you have 12 to 13 per cent. of solid matter, and so large a proportion of it consists of that constituent, fat, which is far more valuable than all the other constituents put together, that it would hardly be fair to give a certificate of adulteration. I do not think such milk ever is adulterated. I think where the fat rises so high as that the non-fatty solids must sink, to some extent, below the usual standard. I am, therefore, in favour, as I was twenty years ago, of having two standards—a standard which exists at present, 2·75, because I think in the case especially of Ireland, where the milk often of a very small dairy consisting of from one to three cows is sold, that if the milk fell slightly below 3 per cent., if it fell to 2·75 per cent., it really might not have been deprived of any of its fat, either by skimming or by withholding the strippings. I am therefore in favour of the present standard, so far as being a standard, on the ground that the milk was really pure, though containing only 2·75 per cent. of fat and 8·5 per cent. of non-fatty solids; yet if the milk is alleged to fall below that, there ought to be no defence except, as I have already stated, on the ground that the analysis was not an accurate one. If the analysis was admitted, I would say that, even in the cases where the milk might fall, as regards its fat, slightly below that (it would not often happen), still the dealer would have to suffer for that, and should try to improve the breed of his cows or should feed them better. With regard to the other standard, I am still of opinion that the standard ought to be 12 per cent. of solids, including 3 per cent. of fat; but I would give the defendant the option of proving by evidence, which should be satisfactory to the magistrate hearing the case, that the milk was pure. In that case I would let a defence be entered on the ground that the milk was pure, but I would let no defence be entered upon the ground that the milk was pure if the analysis was admitted in the case of the present standard.

2418. (*Professor Thorpe.*) You, I think, are or have been Medical Officer of Health for Dublin?—Yes. I am at present.

2419. You are aware of the provisions of the Amending Act of 1899?—In regard to which?

2420. Generally are you aware of the provisions of this Act of 1899?—The Act amending the Sale of Food and Drugs Act? Yes.

2421. Of course, I mean that. You are also, of course, aware that both the analysts and the person charged are in a somewhat different position under Section 4 of the Act than they formerly were?—Yes, they are.

2422. The present condition of things is that the standard raises a presumption, and throws the onus of proof upon the person incriminated?—Yes, it does.

2423. Does the circumstance that the procedure is somewhat different to all parties in any way modify your judgment as to what might be the standards?—It may to a certain extent, I daresay, but I do not think that it alters my opinion substantially. There are cases where a perfectly genuine milk only contained 2·75 per cent. or 2·8 per cent. or 2·9 per cent. of fats; I know it to be the case. Therefore, I should like that where the amount of fat is above 2·75 there should be a defence taken upon the ground that the milk really was pure and that that was the condition of the milk when it was obtained from the cow—strippings and all being added.

2424. There is nothing said as to what the character of the defence should be; it is open to the person incriminated to adopt any line he likes?—That was always open to him, of course, and has been availed of extensively.

2425. Is it not the fact that it was not contemplated to the same extent as it now is by the terminology of the Act?—It was not.

2426. It never was?—It did not to the same extent that the Amending Act has put it.

2427. Of course, it does not necessarily follow that a person brought up under a charge like this is quite in the same position as he formerly was?—No, he is in a better position.

2428. He is in a much better position, is he not?—Yes, he is.

2429. Did you hear Mr. Middleton's evidence?—A part of it only.

2430. Did you hear him say he thought, as a milk producer, that if he sold milk below such a standard as might in fairness be adopted, it was a proper and reasonable thing that he should have to clear the imputation on himself of supplying milk below that standard?—Yes. I heard him also say that by mixing the milk of cows known to yield good milk in the herd with a milk that was known to be rather poor, that a fair average might be obtained. I gathered that, but I did not hear him very well, because I was behind him. It is a suggestion that has been often made before, of course—that they ought to know the quality of the milk they are selling to the public, and that they ought to try and keep up the standard.

2431. Even if it was incumbent upon them to incur a reasonable expenditure?—Yes. But, you see, I am speaking on behalf of the farmers of a country placed under very different conditions from England. Much of the milk comes from very small dairies; some of two cows or three cows are quite common; but in England, where the dairy herds are large, I do not see myself that there would be any difficulty about the 3 per cent. standard.

2432. We attach, if you will allow me to say so, a very special value to your testimony, because you combine so many qualifications. You are a medical officer of health, you are an analyst of long standing and experience, and you represent a constituency of farmers, so to say?—Yes, and also very small farmers.

2433. And may be very small farmers?—Two cows are very often the extent of the dairy. I should like, as medical officer of health, to see a standard of 3 per cent. for fats, because I think in Dublin the children use milk as a staple article of food, and, therefore, the higher the standard the better the food for the children especially in our workhouses, where bread and milk are the two staples.

2434. I am not aware that we have got a very definite or specific recommendation from you as to what the standard, assuming we have to devise a standard, should be in view of the new Act?—I suggested that there should be a standard of 12 per cent. of solids, including 3 per cent. of fats, but that that standard might be disputed by the defendant, in the case of a prosecution the

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onus probandi resting upon him to prove that his milk had fallen below that standard. With the present standard the defendant is allowed to show, in Ireland, at least, that his milk is even poorer than that; I say I would allow that defence no longer; I would only allow a defence as I have already said, on the ground that the analyst had not made a correct analysis, but if it were proved at Somerset House that the analyst had not made a mistake then I would not allow any defence. I go that far. Perhaps, if I was Public Analyst in England, I would stick to the one standard of 12 per cent. of total solids—a standard that I myself have adopted, I must say, for about fifteen years.

2435. And say nothing whatever about the fat?—No. I simply took the standard of 12 per cent. of total solids, and upon that I acted from the beginning of 1863 until this question of the standards came in about seventeen, or eighteen, or twenty years ago. But up to that period that was my standard, and I never knew a single instance in which it was proved that that standard of 12 per cent. of total solids was not correct.

2436. The only other question that I will put to you is one rather of a professional character: Do you think that a shilling per sample is a fair professional charge for an analysis?—No, indeed not.

2437. Do you think, now, that you could undertake to analyse for a shilling by the method that you have described to the Committee?—No.

2438. You could not?—I used to charge a guinea.

2439. Would it not actually cost you, for the materials alone, more than a shilling?—Of course it would.

2440. (*Chairman.*) Then would you say, from your knowledge of this subject, that if an analyst charged a shilling for taking a sample of milk, he would not be able to furnish a reliable certificate?—No, I will not go so far as that. Those who make analyses of milk for a shilling use presumably an expeditious, and, on the whole, perhaps, tolerably accurate way of determining the amount of fat. The evaporation of milk in a capsule is not a process that requires much time; the determination of the fat in the milk is the thing that requires a great deal of time. For creameries the usual process is to use one of those miniature separators of the fats by the use of materials for the purpose of rendering the milk transparent, that is, sulphuric and hydrochloric acids and amyl-alcohol. In that way you can read off the fats in a little vessel—I am sure every gentleman here knows very well what I refer to. That is a quick way of doing it, and it is fairly accurate. But then that will not do in the case of a prosecution; you must then use a more scientific method than that; they do not do that in the Somerset House laboratory, I know.

2441. (*Professor Thorpe.*) Do you know of any public analyst who would dare to bring a case into court based upon results obtained in that way?—No.

2442. He would not?—If he gets a great number of analyses he may work off a large number pretty quickly, because, if by that method he gets 4 or 5 per cent. of fat, he might very properly then say, "I have got 4 or 5 per cent. of fat by this method, and therefore that cannot be adulterated."

2443. That is another matter?—It is useful in that way, and on the whole it helps, of course, to economise the process. But I should not like to do an analysis for a shilling.

2444. The sole value attaching to that method is that it gives you a first approximation to the result?—That is just it. I have heard of analysis having been done down so low as 4d.

2445. (*Mr. Barham.*) Is that in Ireland?—Do not ask me that; it would be another injustice to Ireland if I answered that question.

2446. (*Chairman.*) On the question of tests, do you find that the tests which you adopted twenty years ago were just as efficacious as those adopted at the present day?—I think so; quite. There is a very good method that is devised by Dr. Adams; everyone who is familiar with dairy chemistry knows it; it is saturating a piece of bibulous paper with milk.

2447. Could you do that for a shilling?—No; the paper itself would cost that.

2448. (*Major Craigie.*) You have recommended to the Committee that a standard should be prescribed?—Yes, certainly.

2449. Have you considered whether the establishment of such a standard as you have indicated to the Committee might be followed by the watering down of the higher qualities of milk which you have described to us to-day?—Yes, in a very limited number of cases, by a scientific gentleman understanding the subject. There are scientific gentlemen that understand all about it; they might succeed in doing it, but I do not think in 999 cases out of a thousand they would have sufficient skill to do it.

2450. Would you say that the passing of such a regulation as is suggested by the Act would have the effect of rendering that practice either more or less prevalent than at present?—I think raising the standard would render it less likely.

2451. Less likely?—Undoubtedly; it would not be worth while when the standard was nearly up to what really the milk would be to be trying to find out by the rapid evaporation of the water, or by using this peculiar shilling machine, how much water could be put in. It may be done occasionally, but I do not think it would be very generally done.

2452. Would the fixing of a low standard have a tendency to permit that practice?—I do not think so. The lower the standard the greater the inducement would be for putting in the water and ascertaining how much water would be put in.

2453. Would a standard of 2·75 for fat have a tendency to produce more watering down than at present?—That would apply more to the non-fatty solids. I am certainly rather in favour of raising the standard of the non-fatty solids, because in the poor milk of the morning you still have a high percentage; I think we might really ask for 9 per cent.

2454. (*Dr. Voelcker.*) You have been President of the Society of Public Analysts?—Yes.

2455. You are aware that there is a general belief that the Society of Public Analysts raised their standard some years ago?—Yes; at one time it appears to have been 2·5 for fat.

2456. Coming to a later date, the standard was supposed to be 2·75 for fat?—Yes.

2457. And now the standard is supposed to be 3·0?—That is very recent.

2458. It is a fact, is it not, that it is really not a raising of the standard but an improvement of the methods by which 3 per cent. of fat is fixed, whereas formerly it was only 2·75?—That has been stated, but, of course, I cannot affirm that; you would have to get sworn testimony from every analyst to that.

2459. As one who has been President of the Society, and who has followed the proceedings of it, cannot you answer the question?—I did not go into all the laboratories and work with them.

2460. I put it to you that there is now a better method?—There is now a better method of extracting the fat.

2461. Is it not the fact, then, that what was formerly called 2·75 of fat is now 3 per cent., meaning that the fat is more completely extracted?—It is a hypothesis; I do not think it is more than a hypothesis.

2462. That is the general testimony of analysts, is it not?—That is the general opinion of them, but it is only an opinion.

2463. These figures that you have given, upon which to some extent you base a standard of 2·75, were made twenty years ago?—Yes.

2464. So that what you called then 2·75 in the light of what we have since learnt by better methods, would be quite equivalent to 3 per cent.?—I dare say; but these experiments in my own methods appear to have left not a particle of fat in, because twenty years ago I got larger quantities of fat than I got in the more recent experiments I mentioned to you.

2465. If I may put it so, you have learnt something in twenty years?—I have gone down the other way according to the results of the analyses. I got more fat twenty years ago from Glasnevin cows than I got last year, but, as I said before, the last experiments were to show what was the milk of poorer fed cows, while the others were to show what was the milk of well-fed cows in winter in the house.

2466. Were the methods that you used in the two cases the same?—I do not think I left a particle of fat in these milks long ago, for they were kept boiling and boiling in ether.

2467. (*Professor Thorpe.*) I think perhaps we might clear this up in a moment; the essential principles of the

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methods are substantially the same, and have been the same for twenty years?—Yes.

2468. It is a mere question of a little detail of manipulation?—It is a mere question of that.

2469. (*Dr. Voelcker.*) The amount that you used in your tests is perhaps important in view of the evidence that we have had before on the question of solids; the amount that you gave is decidedly a high one?—Yes. I took 10 grammes at first, but almost immediately afterwards I reduced that quantity to 5 grammes; but then I had very broad platinum vessels—very shallow and very large ones.

2470. We do know now that the residues which the analysts obtained were not as perfectly dried as they are now?—Perhaps not, but I kept some for two days. In some of the earlier accounts of the analyses of milk I have seen 50 grammes taken, but it is impossible to dry 50 grammes.

2471. Then, comparing your experiments at Glasnevin in 1880 and 1889, would you put the differences between those to the fact that in the first case the cows were good cows, and well fed, and probably in such a way as to produce good milk, whereas in the other case (the later year, 1899) the cows were rather run down, and were purposely arranged, so that they should bring out differences of feeding?—Yes, I think that was really the case; besides, I specially wanted them to be poorly fed, and they were poorly fed.

2472. It shows that in your opinion when the cows are poorly fed, you do get something nearer 2·75 than you do with well-fed cows?—Undoubtedly you do. The milk that I get often from the extreme westward parts of Ireland—from Connemara and from part of Clare, where the land is very poor—where it is millstone grit—is, I often find, extremely poor milk.

2473. The class of cows was about the same in both cases?—Yes. This milk that I have just referred to has been sent up even by the owners themselves for their own information, and therefore it was not adulterated milk, although it was very poor.

2474. My attention is drawn to the comparison of the quality of the morning and evening milks in the two sets of experiments?—These are only a few experiments that I have given you. I am always making experiments with milk. I have invariably found the milk of the dairy cows of Dublin poorer in the morning. Everywhere in Ireland, in fact, the morning's milks in fats are not at all equal to the evening's milks; but they are not poorer, they are richer, in fact, in non-fatty solids. I base that upon thousands of experiments. I often take the milk in the morning at Glasnevin. I give fifty lectures there every year, and I am lecturing there at present. I am continually making experiments of that kind, and I always find the morning's milk poorer; that is one thing that should be taken into consideration in a police case.

2475. I find that borne out in your 1899 experiments, but not in the 1880 experiments at Glasnevin?—Yes, it is, but not to the same extent.

2476. As I read the average figures, there is a difference between the morning's and evening's milk of 0·17 only of the fat?—You will find that the morning's milk is poorer.

2477. The average amount of fats in the morning's milk is 3·82, in the evening's milk 3·99?—Yes; the difference is not very great in the early experiments.

2478. In the early experiments it is hardly any?—In the evening's milk it was 4·22.

2479. That is the mixed milks?—No, it is not the mixed that stands as against the 3·82.

2480. The mixed milk is 4·2 in the morning?—And 4·64 in the evening; that is a substantial difference.

2481. There is a very much greater difference in the 1899 experiments?—Yes, there is a very much greater difference than that.

2482. Can you account for that at all?—I cannot account for it; all these were extremely well-fed cows.

2483. Now you are referring to the first ones?—Yes.

2484. Do you mean to say that if the animals are very well fed you will not get such very wide differences?—I do not think you will, if they are very well fed, get such a great difference; the poorer fed cows appear to show the greatest difference.

2485. When you get such good qualities as an average of 4·2 of fat at Glasnevin from well-fed cows, why should you advocate such a low standard as 2·75 of fat?—Because, as I have said here, you are dealing with a country where you may have a dairy composed of two cows. You can see the great difference there is between individual cows. If you are sure of seven or eight cows you might have a standard of 3 per cent. for fats here if you are sure that you had that number. But supposing you only had two? There was a case the other day in Dublin where a man had only two cows, very wretched poor cows they were; he got the cows milked, and it was found that the milk was really wretchedly poor, with the fats lower than 3 per cent. That was in Dublin.

2486. It is rather hard on the consumers, especially in Dublin, where young life is dependent on it, that they should be subject to the milk of these very poor cows?—It is, but still he had a defence. It would be very hard on him if he gave you the whole milk, if he was put in the position of a criminal for selling the milk which really two cows had yielded up to him. The cows were milked absolutely dry.

2487. (*Professor Thorpe.*) But surely is that not another case of procedure where, if the man can show it is the genuine produce of his beast, he might be let off; but that surely was a case to take action on?—Yes. I am in favour of a standard of 3 per cent.

2488. You have no right to depreciate the average quality of the milk in Dublin, or to tend to depreciate the average quality of the milk of Dublin, because now and again you may have milk vended from one or two cows?—I do not. I adopted the standard that Somerset House adopted. I do not want to have a specimen sent to Somerset House and for them to say I am wrong.

2489. Was your standard of 2·75 fixed with reference to Somerset House?—Not rigidly, but I adhered to that when Somerset House fixed that standard.

2490. Now, if Somerset House raised its standard to 3 per cent., would you be prepared to raise yours to 3 per cent.?—I would; I would go in cheerfully with Somerset House.

2491. (*Dr. Voelcker.*) I may put it to you, as a public analyst and as a past President of the Society of Public Analysis, would not that opinion be shared by your brother analysts throughout the country?—I am sure it would.

2492. It is a very important thing for them that they should not be brought into any case and have their reputation at all tarnished by divergent views from Government or other authorities?—Certainly. That is the reason why, no matter what my opinion was with regard to milk—as I know that what I regard as a Court of Appeal is very generally made use of—I would say I will have the same standard. But I had already formed it before—in 1880, before there was a standard at Somerset House at all.

2493. So that your experience of public analysts is that their desire is not so much for prosecutions?—No. I may say that I do not think Somerset House and myself have differed on more than two occasions during the last twenty-five years, although a great number of my specimens have been sent to Somerset House, for the reason that I adopted the Somerset House standard.

2494. Do you think it would be a very good thing if the public analysts of the country should come to some agreement with Somerset House?—Certainly, unquestionably.

2495. That you would apply as to standards and also as to methods of analysis?—Yes. I may say I would have great faith in the standards that would be adopted by Somerset House, because I imagine that they are perfectly disinterested in the matter, and that they would fix standards that were just and reasonable standards, having in view the interest of the public, on the one hand, and the interest of the vendors of the articles on the other.

2496. You said that you in your practice would take into account exceptional circumstances, and, if the fats are very high, you would never think of condemning milk because it showed rather a lower amount than usual of solids, not fat?—Certainly. Frequently I get such, as I receive a great number of samples of milk from all parts of Ireland; I am analyst for twenty-four counties.

2497. You are not alone in this opinion, I take it?—No.

2498. That is a general practice with public analysts, is it not—with the reasonable men among them?—I think it is. I have got samples of milk containing as low as 6·8 per cent. of non-fatty solids—I remember that was not long ago—and yet containing over 12 per cent. of total solids. I would never certify that such a milk

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as that is adulterated ; I should be very glad to get that kind of milk myself.

2499. Though you may not certify that that milk is adulterated, you would also allow that that milk might be altogether abnormal, and not the produce of a healthy cow, possibly?—It might be abnormal, but it would be more likely to be the product of a healthy cow rather than the other way, I should say, as a general rule.

2500. (*Professor Thorpe.*) Anyhow, it would be pre-eminently a good milk to feed an infant upon?—I think a healthy cow would be more likely to give good rich milk than an unhealthy one. I know that is the case with women, at all events ; the milk of delicate women is particularly poor, especially in fats.

2501. (*Dr. Voelcker.*) Is there any objection to the establishment of a standard of solids only? You speak of not rejecting any milk which gave less than 12 per cent. of total solids ; would you fix a standard based on the total solids only and having no regard to the amount of fat?—I am saying, as a matter of practice, that I have found milk with sometimes 13 per cent. of total solids, and I could not really find it in my conscience then to go on the 8·5 per cent. basis ; I really could not, because I did not believe that that milk was adulterated.

2503. A standard of solids only would not exclude the addition of separated milk, would it?—It would not, but then with separated milk you could not get more than 10 per cent. of total solids—at any rate I never yet came across a specimen of separated milk with more than 10·5 per cent. of total solids.

2504. You have given us figures here with regard to the experiments at Glasnevin and elsewhere, but, considering your long practice and the many appointments you hold throughout Ireland, it would be, I am sure, very valuable if you could give us a *résumé* of your experience with the samples that have been submitted to you in your capacity as public analyst, and tell us what was the average composition of those samples as compared with these others that you have given us already?—Might I be permitted to communicate that to you? I can give you the results of an immense number of samples, both the average composition and the extremes, if you wish?

2505. (*Mr. Farmer.*) They are not known to be genuine milks, are they?—No.

2506. (*Dr. Voelcker.*) You could not give us generally now any idea as to whether the average would be above 3·5 or below 3·5, could you?—Yes, I can give you a general idea. I thought you wished an accurate account of the mean composition of the milk on supply in different parts of Ireland. I could give you that if you like, but it would take a little time to do it. I think, roughly, about 7 or 8 per cent. of the specimens of milk taken up in Dublin is adulterated.

2507. (*Chairman.*) You were asked what the composition of milk generally throughout Ireland was?—I may say that in Dublin—I do not know whether it is owing to the vigilance of the inspectors—as I showed in a recent return, we have had a much larger number of convictions for adulteration of food than have been obtained in any other town in the United Kingdom. With regard to margarine, we have had in Dublin about one-third of the total convictions of the United Kingdom. In some of the English towns there was not a single conviction for margarine at all, but we had last year, I think, forty convictions for the sale of margarine as butter. Similarly I think we have had about 150 convictions for the sale of adulterated milk, mostly owing to the addition of water, but in some instances, owing to the abstraction of fat or by the mixing—this is a little bit of a trick with the trade in Dublin—separated milk with fresh milk.

2508. That practice is not confined to Dublin, is it?—No, not at all.

2509. (*Dr. Voelcker.*) Can you, as an analyst, check that at all—can you certify when that has been done?—I could not. It is generally shown when the milk breaks, as they say. When it is supplied to the workhouses and hospitals they complain that the milk sometimes cracks, as they call it, when they heat it, and that is no doubt owing to separated milk being added.

2510. What I would like to get from you generally is this : taking into account the samples that you have analysed for the City of Dublin and for these other counties for which you act as analyst, would that in any way alter your opinion that a standard of 3 per cent. of fat and 12 per cent. of total solids would be a reasonable one?—No, I am in favour, you know, of that standard. The only thing I say for the other standard is simply that I would give the man the opportunity of showing on evidence that his milk was pure, but I would not listen to any evidence with regard to the existing standard ; that is the only point.

2511. Have you any experience of condensed milk?—Yes. I have examined specimens of condensed milk very frequently.

2512. Do you think any standard should be fixed with regard to the composition of that?—I have examined some specimens of condensed milk containing very little more fat than is in uncondensed milk. I certainly think that the quantity of fat which should be eliminated from milk before it is condensed ought to be determined. I think some samples of condensed milk that I have examined are monstrous ; it is very difficult to get convictions though.

2513. (*Chairman.*) What is the standard that you would suggest?—That I am not quite prepared to answer. It is impossible, I believe, to reduce the milk altogether without some little elimination of fat—there are mechanical difficulties in the way, and I believe the milk does not do so well when all the fat is retained—so I am told, but I have no experience myself of those difficulties. One thing I certainly should say—that not more than one-third of the fat should be taken out of the milk.

2514. (*Professor Thorpe.*) Are you aware that for the Service, for the Army and Navy, they do specify a certain quantity of fat that the condensed milk shall contain?—Yes, I am.

2515. Do you happen to remember the quantity?—No, I do not remember the exact figure, but I know that they have a minimum amount. Of course, if the difficulties alleged in condensing the whole of the milk are those that could be overcome, I would be altogether in favour of condensed milk being simply the ordinary milk minus so much, say of the greater portion, of its water.

2516. Are you aware that a large quantity of the condensed milk coming into this country is obviously derived from milk containing upwards of 4 per cent. of fat, and which can be shown to have been so derived?—Do you mean that the quantity of fat actually found in the condensed milk corresponds to that?

2517. Yes, when you have determined the ratio amongst all the constituents—the sugar, the casein——?—I have never met with a specimen of that kind yet ; it is always deficient. I have always calculated it to have been under 3 per cent., and sometimes it is down to 1·5 per cent. Supposing the milk to be restored to its original condition by the addition of water to it, I have always found it, in any that I have examined, well under 3 per cent. I should like to know that there is actually a condensed milk that represents exactly the original milk minus so much water.

2518. I think I shall be in a position to produce to this Committee the results of many hundreds of analyses of condensed milk made for the public service in which it can be shown that it has been derived from milk containing upwards of 4 per cent. of fat?—That is very satisfactory ; and that being the case I do not see why any fat should be allowed to be abstracted. You have to allow for the sugar that is added.

2519. Those are unsweetened milks—simple condensed milks?—I understand.

2520. (*Dr. Voelcker.*) Do you think it should be made obligatory to declare the amount of water that it is necessary to add to a condensed milk in order to bring it up to the standard?—Undoubtedly.

2521. It should not be sold without some statement of that kind?—We should be told of what would mean the same thing—we should be told what quantity of milk it corresponds to—that it corresponds to eight times or six times, whatever it may be, of milk.

2522. And that should be binding?—I think so. One should know that it would make a gallon of milk or two gallons of milk, or whatever the quantity would be.

2523. (*Chairman.*) Have you examined any samples of condensed milk from abroad, or have all the condensed milks you have examined been manufactured in Ireland?—Some were obtained from other sources—they were not all Limerick and Cork condensed milks ; some were foreign. I have not very recently examined any.

2524. In your experience which would you say was the worst?—I think the foreign was—that made in Switzerland.

2525. (*Dr. Voelcker.*) Have you any suggestion to make with regard to a standard for cream?—My experience of cream is that it is a very variable article. We meet with cream in Dublin so thick that a spoon will stand up in it.

2526. Natural cream or thickened cream?—Commercial cream sold in the shops. On the other hand, you could hardly diagnose the difference between some cream and ordinary milk. I certainly think—I am only just giving you a rough case now—that there ought not to be more than 50 per cent. of water in cream.

2527. Have you come across cream artificially thickened?—Only once.

2528. You do not think it occurs to any great extent? —I do not think it does at all. The only thing foreign in it is that they preserve it—that is universally done now. On very rare occasions I have met with sugar, and I met some time ago workhouse milk with rice flour.

2529. Do you think there should be any standard for that separated milk, or skimmed milk, as it may be variably called?—There should be a standard certainly of 9 per cent., because taking out the butter fat from it would, of course, increase the proportion of the non-fatty solids.

2530. That would be in order to prevent the addition of water?—Yes; I would certify that it is adulterated when it does not contain 9 per cent. of solids.

2531. Do you consider there is any distinction between separated and skimmed milk?—There is no distinction between those, but between butter-milk and skimmed milk I do make a distinction. Butter-milk is not sold in this country for food, but in Ireland it is extensively sold.

2532. When I speak of skimmed milk I mean hand skimmed milk?—I say I draw no distinction between skimmed milk and separated milk—I speak of milk that is produced in the dairy which we in Ireland call butter-milk; I draw a distinction there, of course.

2533. (*Mr. Barham.*) Would that be butter-milk produced by churning the whole milk, as they do in Scotland and, I think, in the north of Ireland, or would it be butter-milk produced by churning cream?—From both, but it is chiefly from the whole milk, when the whole milk is churned, which is still very often the case in Ireland; that laborious method is still practised. There is a great deal of butter-milk sold in Ireland, and there have been a great many convictions in connection with it. My standard is 8·5 per cent. of total solids, allowing 20 per cent. of water for churning, and if they exceed that I give a certificate. They sometimes put in 120 per cent. of water and 200 per cent., on one occasion, not long ago. I have a peculiar way of dealing with that which I should like to explain to the Committee now; it has often caused some amusement, and I do not say that there is not some amusement in it. The way I state my certificate is this: I say that this particular sample of milk which I allege is adulterated is milk to which has been added 30, 50, 70, 80, or 100 per cent. of its own weight of water as an adulterant, bringing thereby a total of such and such—say 180 parts of milk and water. It looks more alarming that way.

2534. (*Dr. Voelcker.*) The magistrates understand it? —They understand it perfectly. I have often been asked: How is it you can adulterate your Irish milk with 120 per cent? Of course, there will be no milk at all—it would be 20 per cent. minus, you know. I think it is a better way, and it sounds much more terrific.

2535. (*Mr. Cowan.*) Does the milk come from a great distance into Dublin?—From 150 miles—200 miles I should say would be the outside distance.

2536. Where does the inspector test the milk as a rule? —The inspector, as a rule, goes to the shops in which the milk is sold, or he stops the carts going through the streets.

2537. Where will that milk coming from a distance of 150 miles be tested?—When it is on sale in the shops. We have not done much examining at the railway station; there will be a few instances, but the milk comes locked up, and there is no one in charge of the milk.

2538. It goes up locked?—It goes up in locked cans. The thing we must deal with is the examination of milk coming into the town at the railway station; that is a thing we are trying now to make some arrangement about.

2539. Would you not consider it rather injurious to the interests of the producer that the milk is not tested till it arrives at the place of delivery?—It would be better. Do you mean its final destination? That is the shop.

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2540. No, I mean at the place of delivery—wherever he delivers it. You see, it is generally delivered at the railway station, and it is taken then by the local dealer? —His carts come and take it away.

2541. I know it is strongly felt in the part of the country I come from?—Would you say take it at the railway station or at the shop?

2542. I mean at the station of delivery, in the interests of the producer. He considers he is hardly used, that, when it goes out of his care, he should be responsible for it?—It might be tampered with, of course.

2543. You spoke of 12 per cent. as your standard of total solids?—That was my own standard until this system of forming a standard on the non-fatty solids came into vogue. I adopted the standard of 12 per cent. regardless of how much was fat and how much was non-fatty solids.

2544. I think you said there would be no difficulty in attaining that standard of 12 per cent. in England?—There would be no difficulty where the herds are large.

2545. Do you think that would apply to Scotland?—I think the Scotch farms, too, are large. Ireland is a country of very small farms, some of them of three or four acres. But in Scotland some of the farms are very large; the biggest farms I have ever seen I have seen in the Lothians.

2546. What class of cows are the herds in Ireland comprised of principally?—Some Ayrshires. The Shorthorns, which were originally only used for butchers' purposes, now are very largely used as dairy cows; there are strains of the Shorthorns also. Then there still remains the old-fashioned Irish cow, a long, lanky cow, with terrific horns, locally known by the name of "drimindhus," which is an Irish term, but they are not nearly so common now as in my younger days.

2547. Has your experience led you to think there is any difference between the yield of a Shorthorn cow and an Ayrshire cow?—In former days there was a very general belief, and a belief founded, to a certain extent, upon analytical data, that the short-horned cows did not give good milk, and that the Ayrshires gave better milk; but I think that is not now the case; I think the truth is that the strain of the Shorthorn gives good milk as well as a good amount of it.

2548. (*Mr. Barham.*) You have based a good deal of your evidence to-day upon the two series of experiments that have been made in connection with the farm at Glasnevin?—Yes.

2549. In 1880, I think, you told us the milk was produced under the most favourable conditions for the production of rich milk?—Yes.

2550. I think you further said that the cows at that time were three-quarter bred Shorthorns?—Yes.

2551. The other fourth you did not tell us about; I suppose that would be Channel Island blood, would it not—Guernsey cows?—The Shorthorn strain still is the principal strain.

2552. At that time they were three-quarters Shorthorns?—Yes.

2553. They would not be crossed with what we may term the cow of the country, which you have just described, but they would be crossed with the Guernsey cow—the Channel Island cow?—With the cow of the country, too. You see the Jerseys are not very numerous in Ireland. We have a class of small cows—Kerry cows—and we have the black cattle.

2554. Speaking of Glasnevin, I think they have Channel Island cows there—they have Guernseys, if I remember right?—Yes, they have.

2555. So that three-fourths would be Shorthorns and probably the other fourth would be Channel Island blood?—The larger portion would be Shorthorns.

2556. Coming down to the second series of the experiments, they were all Shorthorns, I think?—Yes, practically.

2557. And the difference between morning's and evening's milks in that case was nearly 2 per cent.—1·9?—Yes.

2558. I am speaking of fat, of course; and in the previous case it was 0·44?—Yes, the difference was not nearly so great then.

2559. So if we strike an average between those two it makes a difference of 1·25 per cent. between the fat values of the respective meals?—Yes; and that is about exactly what my experience, apart from these two investi-

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gations, shows me to be the difference between the morning's and evening's milk. It is a difference of something over 1 per cent., judging from my general experience of milk taken in the morning and taken in the evening.

2560. We have had it in evidence before that it would be about 1 per cent., and one witness here stated a half per cent.?—It would be more than that.

2561. You say you think there ought to be two standards?—I do.

2562. One requiring 9 per cent. of non-fatty solids and 3 per cent. of fat?—Yes.

2563. We have had it before us from several analysts that 8·50 would be rather a high limit for non-fatty solids—that in periods of drought and in other periods the non-fatty solids go below that—and I think you yourself have said that when the milk contains a large proportion of butter you do not expect the non-fatty solids to reach even 8·50?—No, but I qualify it by saying that we must have a total of solids of 12 per cent. I expect that if the non-fatty solids are deficient there would be a relative increase in the fatty solids.

2564. I take it what you mean is not that we should have two separate standards, but that you would look for 12 per cent. of total solids, of which not less than 3 per cent. should be fat?—Yes.

2565. That is what you really mean?—Yes, that is the standard.

2566. Then you say that for really genuine milk, even though the milk were genuine and were proved to be the produce of healthy cows—the naturally poor milk you would not allow them to go below 8·5 per cent. and 2·75 per cent. respectively?—That is so.

2567. So that with 8·5 per cent. and 2·75 per cent. you would look for 11·25 of total solids?—I would. I may say that, as a matter of fact, though I put 2·75 in my synopsis, my standard is really 2·7; that is what I have always taken, as I do not go into the second decimal.

2568. You think below that all milk might safely be condemned, or the person producing it might be called upon to improve the quality of the milk?—Precisely.

2569. And you think they can fairly do so?—I say if there is to be a sufferer in the case the sufferer should be, not the consumer, but the person who, by reason of his carelessness, allows such bad milk as that to come on the market.

2570. With your wide professional experience, you would not recommend a prosecution that could not be defended on analytical grounds below those limits?—Below 2·75 I would not allow any defence except the one defence of the inaccuracy of the analysis.

2571. On the other hand, you would not allow any man to be proved guilty of a criminal offence, as this is, if he produced milk of that standard?—No, I would not, if he could prove it were genuine; I would allow him to have proof of it.

2572. (*Mr. Farmer.*) You told us that in the last series of experiments there was an interval of eight hours between the milkings?—Yes.

2573. That leaves sixteen hours for the night?—Yes.

2574. So you would get as much milk again in the morning as you would in the night?—You get far more milk in the morning, of course—nearly twice as much.

2575. In the first series of experiments, can you tell us what the interval of time was between the milking?—The same—eight hours; those are the hours at Glasnevin.

2576. Have you ever made an experiment having twelve hours between each milking in the day and twelve hours at night?—No, but I have arranged with the Superintendent of the farm to have experiments at several intervals between the first and second milking to see what the effect would be. I imagine that if there were twelve hours' interval there would not be much difference.

2577. (*Mr. Murphy.*) I think you told Professor Thorpe that your standard of 2·75 of butter fat was fixed because in Ireland the people often had to have the mixed milk of two cows?—Yes, and because I have found milk that I knew was genuine myself to be as low as 2·7.

2578. That is the milk of a very small number of cows?—Yes; but I have never found the milk of a mixed herd of several cows yet, under any circumstances, to be so low.

2579. Then I think you told Professor Thorpe that if the Government Laboratory standard were raised to 3 per cent. you would be very pleased to follow it?—I would.

2580. In Ireland?—I would, with a proviso that I would allow a defence on the ground that the *onus probandi* should rest upon the vendor.

2581. (*Professor Thorpe.*) What you mean is that the presumption should be raised at 3 per cent.?—Yes.

2582. (*Mr. Murphy.*) May I carry you one step further, and ask you to think of the conditions that exist in England, where the herds are larger; supposing the Government Laboratory standard were raised somewhat higher than 3 per cent—say to 3·25—would you feel that that standard would be too high?—Seeing that the average of milk is 3·5 of good, bad, and indifferent, that would be coming dangerously near to the average, and keeping very far from an extreme. The extremes of good and bad together make an average of 3·5; 3·25 would be going dangerously near to that, and it would not leave any margin for the extreme in regard to poor milk.

2583. Have you ever made analyses to any large extent of English milks?—Yes, I have analysed the milk of Sir James Blyth's herd of cows at Stansted, Essex, a couple of times. They are Jerseys, and they give a very high class of milk.

2584. They are quite an exceptional herd, then?—Yes. That was very good milk—over 15 per cent. of solids.

2585. We have had it in evidence that one of the large towns in England has a standard of 3·5 per cent.?—I hope they may get it. We should all go and live in that town if we were small children.

2586. Are you able to tell us whether the difference between morning's and evening's milk is greater in relation to the age of the cows or in relation to the period of lactation?—I think it is only in relation to the element of time. With all the cows, whether they are young or old, or no matter what their periods of milking are, there is always that difference between the morning's and evening's milk—always.

2587. So that if that were the case the only way in which the farmer would be able to get over the difficulty would be to equalise the times of milking?—Yes. He is rather at a disadvantage in that. His rich milk comes at night, and, unless he keeps that and adds it to the morning's milk, he cannot have an average quality of milk. The morning's milk that is milked very early in the morning—about three or four o'clock in the morning in the neighbourhood of Dublin—commences to come into the town in the milk-carts shortly after six o'clock in the morning.

2588. So that it is practically outside the power of the farmer to alter the conditions in that respect?—Unless he keeps the milk of the previous day and mixes it with the morning's milk. If milk only comes up once in the day from the country districts, it must be either the milk of the morning or the milk of the evening. The milk of the evening sent up by the night trains is what generally comes up, and the morning's milk might be kept and added to that. In winter time it might be kept safely, because the interval would be seven or eight hours. I imagine that is what we generally get, because sometimes in summer I have noticed the milk from the country is slightly sour. The common test is to heat the milk, and see whether it will crack, as the term is. That is what they do in the public institutions in Ireland. They boil the milk, and if there is separation of the serum from the clot, they consider that the milk contains perhaps two milkings—that there is milk perhaps twenty-four hours old in it. In fact, some of the contracts provide that the milk when boiled shall remain perfectly clear and no coagulum shall be formed. I advise them always to do that. I have drawn up the conditions for the contracts for several of the Poor Law Unions in Ireland. I may mention one thing that I think might interest the Committee. For many years the Poor Law Union of Drogheda, a very large union, embracing a large part of the county of Meath and the county of Louth, were getting extremely bad milk, sometimes with 30 to 40 per cent. of water, and very often milk containing only 2·1 per cent or 2·2 per cent. of fats. This went on for several years, and the contractors were fined from time to time. At last I suggested to the Guardians to make an agreement with the contractors that the milk should contain 3·5 per cent. of fats and a total of 12·5 of solids. "Put that in your contract," I said, "and if the milk is below that standard, though it is pure, have a fine; if it is poor, or rather poor, or very poor, for those three different terms have different fines." That has been adopted by the Guardians of Drogheda Union for the last

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seven or eight years with the most extraordinary effect, and I do not think I have given more than one certificate of adulteration for the last five years, whereas I gave about 100 before. They manage in some way now to keep up the milk to a standard of 3·5—that is the fat. The North Dublin Union has made the same arrangement lately with the same success; instead of getting 30 or 40 per cent. of water, now the milk contains 3·5 per cent. or 4 per cent. of fats. I can furnish the Committee, if they like, with the average results of hundreds of samples from both of these unions, in which the local dealers, in some way or other only known to themselves, have managed to keep up the quality of the milk. Of course, they get a good price for it. In Ireland I am ashamed to say that the price offered for milk often is so scandalously low that no man can make any profit at all. Now they are obliged to give a fairly good price, because no one will tender for the milk at the present time at a ridiculously low price. Fourpence a gallon I have known milk to be tendered for in Ireland to Poor Law Unions. Such unions as the Drogheda Union and the North Dublin Union, with 3,000 inmates, have made that arrangement; the milk has been up to and above the average quality of milk—well above 12·5 per cent. of solids. That is done, I suppose, by taking care to have cows that give good milk, and to have a few Jerseys in every herd.

2589. Does that not suggest to you that it is within the power of the farmer to produce milk of a higher quality?—I give you these simple results, not saying how they have been arrived at. I do not want to penetrate into the mysteries of the dairy. As a matter of fact, the Board of Guardians for Drogheda Union have for years and years been getting milk of that quality, and only now and then it drops a little below it, but it has never dropped, except on one occasion, below 8·5 of non-fatty solids and 2·75 of fat—only once now, I think, in five years, and they send up hundreds and hundreds of samples. Now and then it drops below average—it becomes a milk that can be described as slightly poor or slightly below the average, or poor, or very poor. Those are the terms they like to use. When it is very poor, then there is a mulct, and it has an astonishing effect on improving the quality of the milk of the cows, better than any food I ever knew.

2590. (*Mr. Barham.*) Do you not think that an undue proportion of the strippings might be put into that, as they get a higher price for it?—I think they put strippings in; that is my own opinion. I do not know, but I only imagine that. It is much more likely they put strippings of some cows' milk into this milk that they know is pure, but then they get a good price.

2591. Exactly, it pays them to do that; and they can keep the other back for butter-making?—Yes, quite right, and I am in favour of paying people fairly—everyone, including analysts.

2592. With regard to equalising the hours of milking, you said that you thought possibly that might equalise the quality of the milk?—I think it would; I think one is the result of sixteen hours' production, and the other of eight hours. That is the difference.

2593. That has a great deal to do with it, no doubt?—No doubt it has.

2594. But the quantity of the milk also has something to do with it, do you not think?—I have found that as the quantity of milk decreases the quality of it increases.

2595. And then, you know, I am sure, that cows that lie quiet during the night and are in the warm, produce more milk in that twelve hours than they would in twelve hours of the daytime, when they are walking about seeking their food?—I think so too.

2596. Therefore, in that case even although the hours are equalised, the milk would be better in the evening than it would be in the morning?—Yes, it is quite possible. Of course, during the day the blood is used largely in carrying on the motions of the body and the work done by the animal.

2597. So the quality in that case would not be alike?—It may not.

2598. It might not?—I know those cows from the mountainous parts of Ireland give very poor milk where they are rambling about over mountains. Very poor milk I have got from Kerry, Clare, and other parts, and that is the reason I have adopted that standard of 2·7 in dealing with these poor Kerry cows upon Kerry pastures.

2599. We find Kerry cows in England give very good milk—better than the Shorthorn milk?—They do when they are well fed, but they are not well fed in the mountains of Kerry.

2600. (*Dr. Voelcker.*) Is it the practice with the small man who keeps only two cows to send his milk once a day into the town, or twice?—He will be probably a local dealer; he will have the cows in the city.

2601. (*Chairman.*) In answer to Major Craigie you said if you did lower the standard to one of your standards, as you suggested, namely, 2·75, you do not think anybody would water down the better class of milk to this low standard, because it would require scientific knowledge and proper management to do so without being detected?—I think it would.

2602. Is it not the case that all large companies that deal in milk employ their own scientific man?—Yes.

2603. Surely he would be able to put them in the way of how to do this without detection?—Yes, but I think in England the public companies have such a good reputation that they would not like to endanger it, and they would not, I should imagine. The high morality of these companies would prevent anything of that sort. It could not be done without its being discovered, you know; it would leak out.

2604. You think it would?—I think some discontented employé would let the cat out of the bag for them.

2605. Still, if he comes up to the standard there is no presumption that the milk is not genuine?—Yes, but then to reduce it to that standard would be, I think, a fraud.

2606. If you could find him out?—It would be a fraud because people expect to get pure milk, and it would not be pure if it was watered down to this minimal standard—for it is a minimal standard.

2607. I do not say it would be genuine, but the door would be open to this practice being adopted by somebody?—Yes, I think perhaps a large proprietor might very likely do something of that kind. I hardly think public companies would do it though.

2608. (*Mr. Farmer.*) Do you think the door would be as wide open then as it is now?—I think if the standard were raised there would be less chance of watering down the milk; I really think there would be.

2609. (*Chairman.*) Raised to what point?—When there is such a difference, as at present, between this minimal standard and the average quality of milk, there is a great inducement then to add water to it, because you can add a substantial proportion of water without bringing you down if the milk is good; but the nearer the standard is to the actual quality of milk the less probability there is that they will be reducing that standard. That is only my own opinion.

2610. (*Professor Thorpe.*) You have had more experience, I think, than almost any other public analyst in the operations of the Act; is it your impression that the Food and Drugs Act has acted very beneficially in enhancing the quality of the milk?—I do not know what we would have done without it. When I began the examination of milk in Dublin, a common thing was 50, 70, or 80 per cent. of adulteration. I may mention one case, which I have already referred to on several occasions and put into print. It refers to the Mountmellick Union —I am quoting the union because I am one of those kind of people who in giving evidence like to give names, dates, and everything to make the thing perfectly authentic. I once examined three specimens of milk for the Mountmellick Board of Guardians in Queen's county, in Ireland. It was the milk that was supplied to the children in the workhouse from three different contractors. One lot was composed of two-thirds of milk and one-third of water; the next was composed of equal parts of milk and water; and the third was composed of two parts of water and one part of milk. The three contractors were prosecuted, not under the Sale of Food and Drugs Act, because certain technicalities had not been complied with, but for breach of contract, and they were each fined £40 with costs. We call it in Ireland an historic case. There we have it now in evidence—published evidence—that the milk supplied to the children of a workhouse was adulterated with 200 per cent. of water. That was before the second Sale of Food and Drugs Act had been passed; only when the first Act was in operation, which did not provide any means for collecting samples for analysis. Since the second Food and Drugs Act passed there has been an immense improvement in the quality of milk, not only in Dublin, but, as far as I can learn, throughout all Ireland; and were it not for the Act the milk certainly would not be anything like as good as it is.

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2611. Can you say the same of the milk supply of the United Kingdom, do you think?—As far as I have been able to learn from the reports of the analysts and the reports of the Local Government Board, which I get regularly, I should say that there has been an improvement in England.

2612. Then I suppose there were large purveyors of milk before 1870?—There were, but there were a great number of persons who bought milk from the genuine cow-keepers—say they bought it at 8d. per gallon and sold it at a shilling, but in order to increase their profits added 40 or 50 per cent. of water to it. That was a very common thing. An immense number of dealers in Dublin had no cows of their own, but bought milk from the great cow-keepers or the larger dairy proprietors, and retailed the milk. These have been nearly all abolished now, but once they were far more numerous than the genuine dairy proprietors. I should say they were two to one.

2613. In other words, the trade in milk has passed into the hands of a more reputable class of dealers, dealing probably on a larger scale?—Yes, and those small retailers have nearly all vanished. Most of the milk in Dublin is of excellent quality.

2614. Is that mostly purveyed by large retailers?—By the large and small retailers; in fact, the greater part of the milk in Dublin now is above the average quality of milk.

2615. Is it vended by large retailers or by a number of small traders?—There are a good number of small dealers who have their own cows, some of them having only three or four cows. I speak of this small number of cows, but I call those men genuine dairymen, because they own cows. The others that I speak of were persons who had milk shops and purchased the milk; there are a few of those still, but the majority have had their business taken away literally from them; they were so repeatedly fined for adulteration of milk.

2616. You told us that your experience in connection with the working of these Acts extends over something like twenty odd years now?—I was appointed Public Analyst in the year 1862, in October, and I am now the senior Public Analyst in the United Kingdom, with the exception of Dr. Hill, of Birmingham, who is senior by a few months. I was appointed under the first Act—Scholfield's Act, of 1860—and in my very first year, 1863, I adopted this standard of 12 per cent. The year after I was appointed we had over twenty convictions for the sale of adulterated milk in Dublin, chiefly by the small vendors.

2617. In the course of your professional experience you have now and again been brought in contact with Somerset House?—Yes, I have; not very often though.

2618. But occasionally you have been brought in contact with Somerset House?—Yes.

2619. On the whole, however, I think you led the Committee to believe that Somerset House agreed with your findings?—They did in nearly every instance, I think. In one or two cases there was some difference about the milk that had been left for a very long time, and we did not quite agree; it was only as to the reduction of the amount of solid matter by keeping. It was a very small matter, a matter of a few per cent. of water. With regard to the butter or the other things, they have always confirmed my analyses.

2620. Is your general experience such as to lead you to infer that, provided Somerset House gets a sample of milk within a reasonable time, it is capable of analysing it satisfactorily?—Yes, if it gets it in a reasonable time, but I have not faith in the results of an analysis of milk that has been kept for several weeks.

2621. Would you kindly explain to the Committee why?—I think that in the first place it is very difficult to prevent some leakage of gaseous matter through the cork. I have often found that in samples that I had secured in the ordinary way, even with wax on the cork, that without the bottle being burst, but by the gas escaping, the contents of the bottle had decreased considerably, which shows that there must have been some escape through the cork. Of course, if a bottle is hermetically sealed up so that nothing can escape, I imagine there might be a possibility of making perhaps a fairly accurate analysis by estimating the amount of alcohol that is produced.

2622. What is it that undergoes change in the milk—does the fat undergo any change?—I believe the fatty acids separate.

2623. You believe there is what we call some hydrolysis of the glycerides in the fat?—I think so; I think that the sugar is largely decomposed into alcohol and into carbonic acid.

2624. Of course, it is the carbonic acid which you mean escapes?—Yes, the carbonic acid escapes.

2625. But the decomposition of the milk-sugar into alcohol and into carbonic acid is capable of being expressed with a fair amount of precision by an equation, is it not?—It is, if you have the sugar there.

2626. If you therefore assess the quantity of the alcohol—which you can do with very great accuracy——?—Yes.

2627. You can, of course, assess the quantity of carbonic acid?—You can.

2628. So that the loss by leakage of gas really does not necessarily count in making the analysis?—No. Then there is the conversion of the alcohol into other products.

2629. Now, what products?—It might be into acetic acid or aldehyde.

2630. Is it within your experience with milk which is kept for a reasonable time, say three or four weeks, in a bottle sufficiently well filled and sufficiently well secured, that any considerable quantity of the alcohol passes into acetic acid?—It passes away.

2631. Into acetic acid?—No; I think some does, but I do not think a large portion of it does. But then, the quantity that is generally kept in bottle is very small, and even in the estimation of alcohol associated with the innumerable products of decomposition, I do not think there would be so much accuracy as in estimating the amount of silver in a solution or of an alkaloid.

2632. Perhaps not the amount of silver in solution, but certainly more than the alkaloid?—I would rather try to determine the amount of an alkaloid in a solution of that kind than try to estimate the amount of sugar that was originally present by the aldehyde, the acetic acid and the alcohol, dealing with generally two or three ounces in a bottle. If you had a large quantity it would be a different thing. I would pin my faith more upon the results of a fresh sample of milk than I would upon a decomposed sample.

2633. Possibly?—Then we do not know what some of these products of decomposition really are. Regarding decomposition as a practical matter, there are many bodies that we do not know exactly what their nature is, I think.

2634. Has it fallen within your province to make any special study of sour milk?—I was estimating the amount of gaseous matter given off by milk kept for a long time, but they were very imperfect observations, and were only in reference to the storage of bulk. I admit that there is a possibility of doing it, but I think that there is great difficulty in it when you are dealing with only three or four ounces of milk.

2635. We get it, of course, at Somerset House, do we not?—I have known Somerset House to refuse to examine milk.

2636. I am coming to that. Do you know the conditions on which Somerset House declines to examine the milk; do you know what are the circumstances which led Somerset House to decline?—What I saw stated on the certificate of the milk was, "Too decomposed to admit of satisfactory examination."

2637. Do you know what is exactly implied by that?—No.

2638. Of course, that is a phrase which is sent to the magistrate's clerk?—Perhaps the cork was blown out of the bottle.

2639. The point is this: You are aware, of course, that there are in milk two stages of fermentation; there is the lactic acid fermentation, and there is the butyric acid fermentation—you are aware of that?—Yes.

2640. This is really what I want to get from you: When milk is only in the lactic fermentation, is it or is it not possible to reconstruct the composition of the original milk with a fair approximation to accuracy?—Yes.

2641. You think it is?—I think it is possible. But we must take this into account: Suppose that there are organisms in the milk, which are utilizing a portion of the organic matter in the milk and giving off their own products—I have not made it a very special subject of investigation—but I have often thought we must take into account the action of the organisms that are in milk, and how they may affect the quantity of these other products.

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2642. Quite true; the whole change is one due to the action of these organisms?—Of course. As a rule they belong to the vegetable kingdom, and they are microphytes. It does not much matter whether they belong to the animal or to the vegetable kingdom; some of the lower vegetables are like animals and some of the lower animals are like vegetables. We do not know how these microscopic organisms may affect the sugar and the albumen of the milk.

2643. May I not remind you that the change of the sugar into alcohol and the other products is by the specific action of an organism?—Yes, it is undoubtedly.

2644. And the products which are given off are just as much the products of these organisms as is the carbonic acid?—Dealing with those specific products, as we know, the conversion of alcohol into acetic acid and the conversion of lactin into lactic acid are the specific products of that action; but how do we know there may not be other products which we cannot estimate.

2645. You make the hypothesis; have you ever actually tried, taking, for example, milk-sugar, for that is the main substance concerned in the change, whether it is possible quantitatively to reconstruct the initial weight of milk-sugar by the determination of the products of the change?—Yes.

2646. It is possible?—I think perhaps it is possible.

2647. That is all I want to get from you; I will come to the other point now?—Just as we estimate the destruction of the sugar in our ordinary analysis of beer by the production of alcohol from it.

2648. In precisely the same way?—Yes.

2649. The problem is exactly one of the same order?—Yes.

2650. Therefore, if you can account for the products of the change, you can reconstruct the original material?—Yes.

2651. You said that Somerset House occasionally refused to examine a sample, and you said possibly it might be that it blew out the cork, or something happened to the bottle. Have you no further information to tell the Committee as to the reason why?—I have only the information put upon the certificate.

2652. Of course, that is addressed to the magistrate's clerk?—Yes.

2653. We do not go into scientific or technical details with a magistrate's clerk; it is sufficient for him to know that this thing was what we would not analyse?—Yes.

2654. Do you know, other than the blowing out of the cork or the smashing of the bottle, what are the reasons which induce us not to analyse?—I think they would say so on the certificate; they would state the bottle was burst, or the cork was out of it, and that would be sufficient.

2655. We might or we might not. Supposing we did not say that on the certificate?—If you burst the boiler that would account for the ship being blown up.

2656. Supposing we do not say that on the certificate, then what is the particular factor which has led us to tell the magistrate's clerk that we cannot proceed with the analysis?—I really could not tell you.

2657. You do not know?—No; I am sure there is a sufficient reason though. Do not take it that I am questioning you, because I have been always a most cordial supporter of Somerset House. I used to take it that I was a *persona grata* at Somerset House. I remember I had the honour, when I was President of the Institution, of having on my right hand your predecessor, my friend, Dr. Bell. He was cordially received by the public analysts, and I venture to say, as a past President of the Public Analysts' Society, that they are anxious to be in perfect accord with Somerset House in the interest of the public, and in the interest of everybody. Personally, I have never received anything but the greatest courtesy at Somerset House in any examination I have ever made or in any business I have had to do there.

Mr. H. Carruthers, called; and Examined.

Mr. H. Carruthers.

2658. (*Chairman.*) I believe you represent the Liverpool and District Dairymen's Association?—I do. I have been chairman of that association for ten years, and have taken an active part in all trade matters since its formation.

2659. I believe you have had a practical experience of over forty years in the dairy trade?—Yes, as a wholesale dairyman, a contractor, and creamery proprietor—in the latter branch for about eight years. I am pleased to state that I have never had a conviction in any trade matter.

2660. Perhaps you will just tell us briefly what your views are as regards the fixing of a standard for milk?—I desire to contribute my evidence on a dairyman's standpoint, as it more or less affects us in our working; not as a producer or on the scientific nature or the constituent parts of milk or cream. Our position as dairymen or importers of country milk from many districts entails on us many vexations and differences of opinion that clash with our local authorities when too high a standard is demanded. There are many circumstances that constantly crop up such as sultry weather, depressed atmospheric influences, the flood months each season, and severe droughts. These all materially affect the standard results. My experience in standard matters is much influenced by the returns of butter yields, as I favour the churning of whole milk, and keep a record of each churning, and its results are at all times remarkable—especially from atmospheric influences. Occasionally I add to such record the state of the weather as a reference, and invariably find them to agree. This all, to my mind, shows the variableness and uncertainty we have to contend with in standard results; so much so that we dread almost passing through these critical times. I have some dairies that when samples are sent for analysis the certificate is genuine good milk, and their results by the churn or the separator are not satisfactory; the colour is pale, but has a nutty sweet flavour. In the dealing with such dairies it would be a hardship to have an Imperial standard higher than 2·75. No two counties agree in their standard of fat, but still with each county it should be imperative to supply their full average of fat; if the dairyman should demand a high standard, and afterwards tone it down to a lower standard, the dairyman should be held to be tampering with his supply, and be liable for prosecution. In all cases in which such tampering is in dispute, then recourse should be had to a high authority for final decision.

2661. You say you do not wish to give evidence in any way on the scientific side of the question, but merely as a dairyman?—True.

2662. In that capacity you say in your synopsis that you are favourable to two standards—an Imperial standard and a country standard; would you kindly explain how you would propose to fix those?—I may say that the supply of Liverpool is somewhat peculiar. We have two distinct traders; we have what we call the Cow-keepers' Association, who are in very large numbers—I should think there are about 600 of them, and these are producers, I should think, of about 20,000 gallons a day. Then we have the dairymen. We designate them dairymen if they have milk consigned to them coming from the country. Hence we have the two distinctions. I have been asked to represent the cow-keepers as well in conjunction with our own association. They have not given me any formulated tables or data to go by, but from the discussion and from the number of samples that they have had analysed at various times, they simply came to the conclusion that they, as a body of members numbering nearly 400, should pass this resolution—that they could not possibly suggest a higher standard than 2·75. My basis for suggesting the other standard for milk from the country was on the assumption, of course, that we get a higher standard of milk from the country districts than is fed in the town. I assume a higher standard for that which we get from the country in order to meet the losses of fat that we have to guard against in the distribution of our milk. We would wish to have a margin in that respect; but, of course, when you are making a law for one you have to make the law cover all. I may say for myself that I would refuse to receive milk with less than 3 per cent. of fat if it was continuously so. Frequently we have it at 3·5. We have so many variable changes constantly occurring through the twelve months which the one law would have to cover. We have the flood season of the year to contend greatly against, and, as I have said, we have immense variation of weather, atmospheric changes, which act very injuriously on the milk in our point of view. We get our supplies from a very large

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number of sources all over the country. I suppose the nearest supply we get from the country districts is twenty-five miles off, and it may go up to 150 miles. I should think the bulk of our country supplies will average sixty or seventy miles distance; and at times, in the winter months, of course, we go farther; we sometimes even get large supplies from Scotland in the winter months, but only during the winter months. From my knowledge of the class of milk that we get from the country, as I know that a dairyman can command his supply and get a class of milk that would reach up to 3·5 per cent., I would not allow a door to be opened for the quality of the milk to be reduced by toning it down by means of separated milk, as is sometimes the case, thus injuring the reputation of the trade. We think very little of the adulteration by water; comparatively speaking it is small. The greatest danger we have in Liverpool arises from the addition of separated milk to the new milk, although all respectable dairymen do their best to discountenance its use. The new method of distributing the milk is that a great deal of the milk coming during the night time is carried to depôts, and is distributed the following morning, and what comes in the morning is distributed in the afternoon. The old style of dairy trading in Liverpool has always been that directly it came into the station carts were loaded, and it was at once distributed to the various shops throughout the city for sale. I think that in many respects there is a greater danger in the milk being carted to the depôt, and remaining there probably for a number of hours before being distributed—I think there is a greater danger of a certain number of customers getting an undue quality—either too rich a quality on the one hand or too poor on the other. It is very difficult to manage at times. I have noticed also that it is most difficult to get a sameness in the samples with these atmospheric changes in the weather. One of the greatest troubles we have is getting it from so many sources with various standards. I may say that our standard in Liverpool is 3 per cent., and as far as possible it is fairly well carried out. Last September and October, which was an exceptional time, and during the three flood months, we had any amount of samples that did not average more than 2·6 or 2·7. It is to cover these divergencies and differences, and what not, as a rule, that I think it would hardly be fair to suggest having the standard that is to cover all the eventualities for the year higher than the 2·75.

2663. Then, according to your statement now, you will have only one standard?—Only one standard certainly.

2664. I understood from your synopsis that you advocated two?—When preparing that I suggested a higher standard for the counties, but I find that that would not work.

2665. I understand that suggestion is withdrawn?—I do not see that it would be workable to have two laws.

2666. Therefore you would put your standard at Liverpool at 2·75?—That is the opinion of our Association numbering 50; it is the opinion in the resolution formed, which I have here from the Cowkeepers' Association, numbering over 400 members; it is the opinion of the Manchester Association, who passed also a resolution, and the same came from St. Helens and Birkenhead.

2667. You tell me that the standard in Liverpool is now 3 per cent.?—That is the local standard.

2668. Still in Liverpool?—Yes.

2669. Yet you speak, as I understand, for Liverpool, and you want that standard lowered to 2·75?—The Imperial standard I want to be 2·75; I would like to keep up the standard, I would not have the standard reduced but I say that in any cases in which it can be proved that there is no adulteration they ought to have recourse to the 2·75.

2670. In spite of the fact that you have a difficulty in keeping it up beyond 2·75, and that your standard in Liverpool is 3, yet you have never been subjected to any prosecution, and you have not yourself experienced any difficulty in meeting the requirements of the law?—I have not made that remark from any spirit of egotism. I have not been fined, I only put it in that way, because certainly the idea is to raise the standard, not reduce it. I am not going in to reduce the standard for the sake apparently of any personal gains by myself or by any respectable dairyman there.

2671. No; I understand you are speaking for the general body of dairymen in Liverpool?—Yes.

2672. Are there many prosecutions in Liverpool now under this what you call high standard of 3 per cent.?—Not so many. We had one the other day there—it was the case of a farmer—in which it was only 2·66.

2673. I take it that these low standards you mention are only occasional; they are abnormal, and the general body of milk in Liverpool comes up to the standard required?—The great difficulty is the difference between the morning's milk and the evening's milk, and sometimes samples are taken of the morning's milk, at a disadvantageous time, such as coming to the dreg ends of their pans, in serving out, or dealing out. There is a great difference as regards the distribution in London and the distribution in Liverpool. The distribution in Liverpool is done by dipping in from the top, and in London the bulk comes from the bottom, and naturally here you will have the worst milk first and the last of the can is the best.

2674. Still I cannot gather from you that there is any difficulty in Liverpool at the present moment in keeping up to this high standard?—Yes, there is a considerable difficulty, because it is so frequently 2·80 and 2·90.

2675. Are there many prosecutions now?—No.

2676. That would show there is not much difficulty in keeping up to it?—There is a great difficulty in keeping it up; they say they do not get it, and they cannot give it. I do not think of late they have made the prosecution perhaps quite so stringent as hitherto. I suppose, perhaps, because of the inquiry.

2677. (*Mr. Barham.*) You mean not so many samples have been purchased recently?—Not so many samples have been taken.

2678. (*Professor Thorpe.*) I may say with respect to that the gentlemen who act for Liverpool—Mr. Collingwood Williams and Dr. Campbell Brown—on the other Committee, have furnished a tabulated statement of the whole course of prosecutions for some years past down to recent times, and that that tabulated statement has been printed?—That can be done by the Cowkeepers' Association. It would be the only method as far as they are concerned, of course, that would be of any service to you, but I regret they have not got it.

2679. According to that return it is a fact, as you state, that the number of prosecutions is comparatively small in Liverpool—as a matter of fact smaller even than in Birmingham?—They have not been large certainly.

2680. (*Dr. Voelcker.*) You mention that you are in trade, and fear a difference of opinion amongst certain people; do you not think that if a general idea got about that 2·75 was the standard instead of 3·0 there would be a good deal more adulteration than there is?—I think not. The tendency of the trade in Liverpool is to be concentrated in the larger companies; the smaller men are being driven out. The larger companies have a greater business reputation to maintain compared with what the smaller men have.

2681. In other words, the trade is getting into better hands?—Yes.

2682. And concurrent with that there is, as you say, no practical difficulty in getting up to the 3 per cent.?—I say that the loss of fat we have in the distribution of the milk is a great trouble with us.

2683. In those cases where you have 2·6 of fat only you have no evidence whether those were adulterated or not—they may have been adulterated for aught you know?—They declared they were not.

2684. It was only a declaration, and there was no proof, so some of them might have been adulterated?—This is a case in point:—"Liverpool.—Interesting Milk Case: The varying qualities of milk were once more proved in this prosecution. Mr. Charles Lawton, of Hatherton Hall, near Nantwich, was the defendant, and the complaint against him was that one of his cans delivered at Lime Street Station contained milk with only 2·66 per cent. of butter fat. Fortunately for Mr. Lawton his case was taken up by the Cheshire Milk Producers' Association, and Mr. Brassey on their behalf argued the point as to the varying quality of milk with great cogency. He referred to an extended series of experiments, conducted by Mr. Charles Estcourt, published in a work entitled "Commercial Organic Analysis," and the author of which was Mr. A. H. Allen, F.I.C., F.C.S., formerly president of the Society of Public Analysts. It was clearly shown as the result of a large number of experiments that the same cows gave milk containing a much less percentage of butter fat in the morning than in the evening, the average variation ranging from 2·74 per cent. in the morning to 3·81 per cent. in the evening. Though acknowledging the justice of Mr. Brassey's argument the Bench adhered to the strict letter of the law, and imposed a nominal penalty of

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one shilling and costs. Had the three cans of milk been treated as one consignment, and a sample taken from a mixture of the whole, there is no doubt it would have passed the test." This was given on the 2·66. It is the meeting of such cases as this in our capacity as dairymen that endangers our position so much.

2685. The mixed milk would probably have given 3 per cent.?—According to that statement.

2686. (*Mr. Barham.*) You are representing 400 producers of milk in Liverpool, I think you say?—Yes.

2687. Do they include all the more respectable part of the dairymen?—They are all producers; they produce the milk themselves. We still have the dairymen.

2688. They have the reputation of being honourable men of business?—They are so.

2689. Do you think in suggesting that you should come here and say that 2·75 would be a fair percentage of butter fat there is any other object in view beyond the desire to do that which is fair and right? What I mean is, do you think they had the object of reducing the standard so as to put separated milk in, and so make a greater profit, or to add water to the milk, or anything of that kind?—There is not the slightest idea of that. They get a high price for their milk. The conditions in which they keep their cows and their feed, particularly the feeding, I doubt not, have a great deal to do with it; they feed them well, and I suppose town fed cows usually have other ingredients in their foods different from what country fed cows have. However, they have not as high a class standard of milk as the country milk is.

2690. Then you speak of another class who are dairymen, and buy milk from farmers, and I think you said that the standard at Liverpool was 3 per cent., and at Manchester 2·75?—I do not say that, but I say they recommended 2·75; I believe 2·75 is their standard.

2691. It was given us in evidence here by Mr. Beecroft, representing the Cheshire Dairy Farmers' Association?—I believe it to be so.

2692. May I ask whether what he said was correct, and that is, that the Cheshire Dairy Farmers consider it a hardship that they should be called upon to supply 3 per cent. of butter fat for Liverpool when they have a difficulty in doing it?—I should have thought there was no difficulty; I have never experienced any difficulty in getting over 3 per cent. with the Cheshire milk.

FIFTH DAY.

Thursday, 22nd March, 1900.

PRESENT:

Lord WENLOCK, G.C.S.I., G.C.I.E. (*Chairman*).

Mr. GEORGE BARHAM.
Mr. GEORGE COWAN.
Major PATRICK GEORGE CRAIGIE.
Mr. SHIRLEY F. MURPHY.
Professor T. E. THORPE, F.R.S.
Dr. J. AUGUSTUS VOELCKER.

Mr. R. HENRY REW, *Secretary*

Mr. JOHN SPEIR, called; and Examined.

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2693. (*Chairman.*) You come from the Highland and Agricultural Society of Scotland, I believe?—Yes, I am their representative. They have only been asked to send one witness. The members that I represent, I may say, number about 6,000, and they are principally farmers and landowners.

2694. Of course you know that among that number a great many are interested in the dairy business?—Yes, a large proportion of them at any rate.

2695. What do you come to tell us from your clients as regards the standard of milk?—The question of the quality of milk has engaged my attention for a very long number of years, and more especially the effect that foods and different classes of treatment might have on stock. I have sent in copies of a series of experiments that I have made for various years. On certain pages of these you will find the averages which to a great extent speak for themselves. I may say that these feeding tests are in many cases extreme from the food point of view; they were really drawn out so as to show extremes—so that if you could produce either very poor milk or very rich milk you would be able to do it under these circumstances. That accounts for the making up of the different rations in the peculiar way in which many of them are made up.

2696. Does your experience lead you to believe that you can alter the quality of the milk by the feeding?—Not very much for any material length of time. There is a very big alteration for a limited time. During the average of my experiments the maximum seemed to work out, apparently, between the 10th and the 20th day; after that a continuation of the same feeding brought it down between the fifth and sixth weeks, to, practically speaking, the point where you started from. In connection with that, I might draw attention to page 35 of the series of experiments, No. 3. On page 35 you will find a table giving 14 different periods of feeding running up to five weeks with one particular class of food or mixture of foods; the analysis of the milk from the fat point of view of each of these weeks, and the average of each of these weeks. The average, I may mention, is a sample drawn from each cow, put into a bottle, and kept to the end of the week, and that is considered as the average. In reality it would not be the actual average, because the same quantity was taken from each cow's milk whether it had 10lbs. or 20lbs.; but from the quality point of view it is the actual average.

2697. (*Mr. Barham.*) Is that one meal or two meals; I think this is all afternoon's milk or evening's milk?—The day was evenly divided into two portions, and this is the afternoon's milking. You will notice there, if you will refer to the bottom line, that the rise from the first to the second week, and the second to the third, and so on, is, comparatively speaking, steady. The highest point seems to have been reached in the average of the second week. Had each day been tested, I believe individually you would have found it before the end of the second week. Then it goes steadily down until you are within a very few points of where you started, when there is only a difference of 0·09.

2698. (*Chairman.*) That virtually means that there is very little difference?—My own opinion is that when you only get this slight difference with the extreme classes of foods that were used, that by using foods of a more moderate nature the difference would be very much less—but you could make it much less than 0·09, and work them on sufficiently long to get back to your original point.

2699. Then your opinion is on the whole that a fixed standard could be adopted for general use in the country?—Quite readily; I have no hesitation at all in saying that.

2700. And it is your idea that that is the general feeling among those whom you represent?—My instructions were very definite from the Board of Directors on that point—that I was not to recommend that any standard should be fixed below 3 per cent. of fat; they left it to my own discretion as to what it might be above that, but certainly it was not to be under 3 per cent.

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2701. (*Professor Thorpe.*) Of fat?—Yes, of fat. My own opinion varies a little from that, and I expect I may now give you it. If you are going to fix a definite standard under which the owners of all milk will be prosecuted when the milk is found under that standard, I am not inclined to go something further than 3. If you are going to make some other provision that the owners may have the chance of either appealing to the cows, or putting some buffer, as it were, between the prosecuting agent and the Court, then I think you could quite easily go up to 3·2, and probably to 3·25. Then another precaution would need to be made, namely, that if you are dealing with stocks numbering only two or three, a certain amount of discretion must be used; you will there need to give the owner in every case the opportunity of appealing to the cows.

2702. (*Mr. Barham.*) When you say discretion must be used, do you say that with regard to the 3 per cent. or with regard to the 3·2 per cent.?—For what number of animals?

2703. For the two or the three that you speak of?—If you are going to use three animals or under, I say if you make the standard at 3 per cent. you would need to give the owner an opportunity of appealing to the cow.

2704. (*Chairman.*) But I suppose whatever standard may be adopted, if any should be adopted there would always be a chance given to the producer of that milk if it falls below the standard of showing that it is really genuine milk?—No, I cannot go the length of that.

2705. Do you mean that you would not do that with a big herd?—It depends altogether where you fix your standard; if you fix your standard at 2·5 or 2·75, as many may ask you, I certainly do not see any reason at all for giving anybody an opportunity of appealing to the cow.

2706. That is if you fix it so low?—Yes.

2707. (*Professor Thorpe.*) Are you aware of the wording of the particular clause of the new Act under which we are sitting?—I understand that it does give the owner an opportunity of doing so, but I am not sure that even the Act is correct in the procedure that is adopted there. There is no special provision for making an appeal immediately after the sample has been taken. I have not recently read the Act, and I am only speaking from memory; but I would suggest that if you take this precaution, and an appeal is made to the animal, you should have that as soon after the sample has been drawn as possible; and also, if you can, from the same milk—either the morning's or the evening's milk, if the sample has been drawn from either, take it from that same one; if it has been drawn from the whole, also take it from the whole.

2708. In other words, the reference sample, as we may so call it, must be taken under precisely the same conditions as that which is impugned?—I do not think that it is possible to take it under precisely the same conditions, but you should approach as near as possible to those conditions.

2709. (*Chairman.*) Has it occurred to you that if the standard were fixed, say, at 3 per cent., milk of a higher quality would be brought down to that standard in general practice?—I think that is what is being found out just now.

2710. It is being found out, do you say?—It is being done just now.

2711. Because there is a *quasi* standard in existence now?—Yes, I understand so.

2712. And you believe that the richer milks are already being brought down to that supposed standard?—I have no hesitation in saying that my belief is so; I have no doubt about it.

2713. And yet you recommend that a standard should still be fixed, and you are prepared to run the risk of the richer milk being reduced to what we may call the new standard?—Yes, but I have not said that you are to fix the standard at 3 per cent.

2714. But you recommend it?—No, I say that if your course of procedure is arranged in such a way that a prosecution immediately follows on milk under 3 per cent. being found that I would not go above 3 per cent.; but if you have some other appeal, and there are several ways in which it might be done, I would go the length of 3 2 or 3·25.

2715. Yes, I understand that; but even 3·2 or 3·25 would give an opportunity for the milks over 4 per cent., and we see that a great many of them produce 4 per cent.?—Yes; if you follow a certain procedure in the Act, and get it arranged in such a way that the test can be made as soon after the prosecution sample has been drawn as possible. Take what might be looked upon as the composition of average milk; I put that myself as from 3·5 to 3·75; but you have really to deal in many cases with abnormal milk or abnormal conditions, under which milk is produced, and unless in making a legal standard you make conditions which will be stretchable to a very great extent it might lead to inconvenience.

2716. (*Professor Thorpe.*) You mean it might lead to hardship in individual cases?—Yes.

2717. Not inconvenience so much as actual hardship? I mean we might be prosecuting an innocent man?—Yes, that is what I mean.

2718. (*Chairman.*) Another point I should like to get your views on is in connection with Ayrshire cows. We have had evidence to show that Ayrshire cows, although they give a large quantity of milk, give milk of a rather poor quality; now what have you to say as regards that?—I am speaking from what I have found as my own experience. Richness in milk is a matter of degree. My average over two years in these feeding tests with animals, running from four up to eight (eight for nearly half the time) comes out at 3·74 under the extreme conditions under which these animals were fed. Some of them were fed with the best known composition of foods possible, to give the lowest quality and the biggest quantity; others were fed quite the reverse way, so that when the whole lot is mixed up together you have pretty near what might be looked upon as average milk.

2719. (*Major Craigie.*) How many cows did you experiment with?—Eight were fed for fully more than half the time during each test. These samples, as I have already said, were taken from the beginning of the year to the end of the year, and over two years.

2720. (*Chairman.*) Are they all Ayrshire cows?—Yes.

2721. Which tables do you propose to put in on that?—I am now dealing with the full table on page 30 of No. 3 series of experiments. (*See Appendix* XXX.)

2722. Your experience is that after all Ayrshire cows are not so poor in their milk?—I do not believe in any such thing as their poorness with regard to milk. I do not know who has been making the remark that milk from Ayrshire cows was poor, but I would like to know if these people who make the remarks have really tested the milk as it came from the cow. I do not give anything at all for Dr. Thorpe's testing or Dr. Voelcker's testing of milk that has been brought in to them; that does not mean anything; it only means the testing of a sample of milk—that is all.

2723. I am much obliged to you; that is rather important. I have got a lot of Ayrshire cows myself, and I am having them tested. I forget who told us, but somebody told us that Ayrshire cows could not be expected to produce under the best conditions milk as high in fat as 3·5 per cent.?—Against that again I may just give you what is the experience of the opposite side of Scotland. The Edinburgh Dairy Association had a meeting the other day with our Chamber of Agriculture with regard to sending a witness here; they concluded that the Chamber should send a witness who would advocate 3·5 or 3·75, I forget which—it does not much matter—because they said, our cows are Shorthorns, whereas on the west your cows are Ayrshires, and they produce so much richer milk than what the Shorthorns do. That only shows how people who really have a sort of rough-and-ready idea of the subject, and do not know the details of it, are apt to make statements which, when you probe them to the bottom, have very little in them at all.

2724. (*Professor Thorpe.*) You speak in your *précis* of seeing what effect an extreme supply of food would have; what is the exact meaning that you attach to the word "extreme"?—It was really a starchy food; a large proportion of the foods were either starchy or albuminous, and in one or two cases it was arranged in such a way that the dry matter would be very large, and in others very small. If you refer to the details of the feeding of these you will find that in some cases the dry matter given to each cow per day ranged up to 35lbs., probably over; in others, for instance, you will find that the dry matter in the ration was only 16·4lbs.—not a half of what was being given at some other time. The consequence was that these animals, while they milked very well, fell off very largely in live weight. Each of these animals in the first five weeks fell off 42lbs., while with some of the other rations they increased to almost an equal extent.

2725. (*Dr. Voelcker.*) You took extremes?—It was an experiment with extremes of feeding. A great many of the rations were extremes either to the one side or to the other, with an occasional one in between more moderate in every way, or more average, so as to bring out these extremes. It was thought that as long as you used average foods you would have no effect upon the milk at all other than probably a greater quantity, which by using more extreme food would have any effect it would be seen more readily. That was the intention.

2726. (*Professor Thorpe.*) Have you formed any theory as to how it is that the cow immediately after the change in diet gives a rapid increase in the amount of fat?—My knowledge of physiology is not such as to warrant me in giving any opinion in regard to that at all. I know it, or at least I think I know it, as a fact; I can only say that I think it is a fact; I cannot give the reason.

2727. It is not anything in the nature of a nervous stimulus to the animal, is it?—I am not prepared to give any opinion at all.

2728. In your examination in chief you rather hinted to the Committee that there were one or two methods in your mind by which a milk producer if impugned might clear himself?—Yes.

2729. Would you kindly indicate how he might proceed?—The most sensible and the easiest carried out seems to me that the person taking the sample might return to the cowshed where the milk came from, the following meal if you might so express it, if he knew in plenty of time, and ask to see the whole of the cows milked, and draw an equal sample from each, and then submit that. Or you might have a small committee in each district, either official or unofficial, to whom the appeal might be made, and who might also go and take a similar sample. I have considerable experience of Denmark, and I know that in Denmark a body somewhat on the lines that I have sketched is in existence. I do not know the details of it because somehow or other it never occurred to me when in company with the Danes, or when in the country to go specially into the details of it, but I know that it is being daily put into practice. It seems to me that it is only a question of arranging the matter to the satisfaction of our own people here according to the way that our dairies are carried out.

2730. But in practice that would scarcely be possible, would it; at all events we could not approach the ideal conditions of comparison from the circumstance that some considerable time—a week, say, at least—would elapse or might elapse before the finding of the analyst was known?—That certainly is a difficulty, but I cannot see that it is a difficulty which cannot be overcome. If you have a sample submitted to you, you should at the outside be able to give the analysis in 48 hours; and when the inspector takes that sample he should always have it in his mind that he may be under the necessity of taking another sample within 24, or at the outside 48, hours; and when he takes that sample he should see that he at once puts it into the hand of an analyst, and he should act upon whatever may be the result afterwards. If you are going to carry out your method of operations in such a way that a week, or probably longer, elapses between the taking of the first sample and the taking of an appeal sample, I am afraid you would have a great many prosecutions that would break down.

2731. Let us just think what the actual conditions of things are. An inspector takes a sample from a retailer of milk; that is analysed; in the course of a few days the results are known; the inspector really does not know who the producer of the milk is, and he has to go back to the retailer for that information?—That is so.

2732. What next is to be done?—In that case you must try and get to the retailer within 48 hours at the extreme; he being the person who has the milk in possession for the time being must be responsible, and if he is made responsible he will very soon see that the person supplying him keeps his milk up to his standard.

2733. That might be comparatively simple where the charge was abstraction of fat where the sole criterion was that the milk fell below, say, 3 per cent. of fat?—Yes.

2734. You have not dealt, however, in the course of your examination-in-chief with the possibility of any other standard, say, the solids not fat being the criterion?—I have mentioned in my *précis* as the lowest standard that I would allow of solids not fat to be 8·5; even there in some cases I would incline to say you should allow an appeal sample to be taken, because while my own samples have averaged a long way above, there seem to be, judging from other people's experience, occasionally samples that are very much less; and in a previous test that I carried out in 1893 and 1894, for some reason or other I had several samples slightly under that.

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2735. Coming back to where we were, you see, of course, that what the analyst has to do is to determine the amount of fat and also the amount of solids not fat?—Yes.

2736. That is an operation which takes, or ought to take, some little time if a police charge is to be founded upon it?—Yes.

2737. It is quite possible to arrive at the facts fairly approximately very rapidly; it is conceivably possible that as a first approximation a rough and ready analysis might be sufficient in order to make the appeal to the cow as quickly as possible; but it does not seem to me that such a rough and ready approximate analysis ought to be tolerated when you go further and bring a man into Court?—My idea is rather different from yours. I think that in making the first analysis it may be made by any system or method likely to give an approximate result quickly. If the person has a suspicion that either water has been added, fat has been abstracted, or separated milk has been added, you can then make provision for chemically analysing the remainder of that sample or for taking another, and you can have arrangements for having it thoroughly tested in the shortest time possible. You are then in a position to defend yourself as the prosecutor, and can give the person owning the animal or producing the milk the quickest opportunity possible of appealing to the cow if he thinks fit.

2738. This is how the thing shapes itself in my mind. In practice it would come out that whenever an inspector took a sample of milk from a retailer, he would have to ask the retailer from whom this milk was originally obtained, and he would have there and then to make an appeal to the cow; in other words, he would have to have a second sample in reserve whilst the first sample was being inquired into by the analyst, the second sample in reserve being the appeal to the cow?—Yes, it might be done in that way, but I do not see that in taking a sample from a retailer that the retailer at all needs to be consulted as to who has produced it.

2739. How is otherwise the appeal to be made unless the retailer is consulted?—The prosecution must make the appeal to the man who has retailed it—that is the only person he has got to deal with—and allow him to produce whatever evidence he thinks fit.

2740. The difficulty is of course that the retailer would take no action unless the quality of his milk was impugned—that might be a week or ten days after the sample was got, and the appeal to the cow might not therefore be of very much value owing to the lapse of time which had intervened?—I am inclined to insist that if appeals are made to the cow you should reduce the time as far as you reasonably can. I am not prepared exactly to say what is the lowest limit that is possible, but I certainly would say that you should make it as low as ever you reasonably can.

2741. I am entirely with you; I am only trying to think out with you exactly what the procedure would be. I am anxious to give the person impugned every opportunity of clearing himself. I am anxious, in fact, to facilitate what I suppose you yourself represent, namely, a relatively high standard, say, 3·25 of fat, if adequate provision can be made for the person impugned to justify himself?—Yes.

2742. I am only anxious to devise adequate machinery for that presumption to be rebutted as quickly and effectively as possible?—I might have been in a better position to have made suggestions on this point had I been given notice that this was a portion of what was likely to be the inquiry. The inquiry as far as I am concerned was entirely as to what might be the average composition of milk, not as to the procedure that was likely to be followed in cases of prosecution.

2743. (*Chairman.*) The words which are effective here are that "unless the contrary is proved" you raise a presumption that the milk is not genuine?—I have no hesitation in saying yes to that.

2744. (*Professor Thorpe.*) You hinted that you had two or three other methods by which the presumption could be rebutted—that is one that you told us of, namely, the appeal to the cow; what are the others?—It was a matter of procedure in appealing to the cow, that is, whether the prosecutor was to go directly to the cow and have the sample taken himself, or whether he was to appeal to a small committee of a particular district

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which, as I understand, is the method in Denmark, or something after that.

2745. What you wish is if possible that the Danish system should be imported into our procedure, or something like that?—That procedure; I will not say the Danish system. I do not see any reason why we as British people should throw over anything which may be for our own good or anybody's good simply because it has been introduced into Denmark; if it is going to be of any value to us why not take advantage of it on the spot and use it at once.

2746. I quite agree with you; I think there is a great deal in the Danish system that we may usefully copy?—I can be as patriotic as most people, but I can utilise information which a foreign nation can produce if I can see it to my advantage.

2747. (*Mr. Barham.*) You do not know what the system is, and it seems difficult to me to understand how you can recommend a system that you do not know?—I know the system, although I do not know the details of it. I know it only in the rough—that a certain small committee in particular districts where these Danish dairies and creameries are, exists, to which they can appeal, and which decides on the spot whether or not a prosecution is to follow or whether some other appeal is to be made.

2748. (*Professor Thorpe.*) We have a system already here by which we work in collaboration with the Danes in all cases of suspicion of this kind, and we are perfectly familiar with the details?—I was not aware of that.

2749. Is it your experience that milk producers are now in the habit of using themselves means to determine the quality of their produce?—Very few. There are a small number, but still the number is so very small, and they certainly do not use methods which could be called other than rough—even very rough and ready methods.

2750. Is it because they do not know the existence of better methods?—No.

2751. They do know of the existence of better methods?—They know of the existence of better methods, but you must always remember that even the testing of a sample of milk by any of the centrifugal methods with the assistance of acids, if not in daily use, is of considerable trouble to the person who begins to take a sample to-day and tests two or three times, and who throws it aside then, and probably does not use it for the next month or two months. Where you are doing work of that kind every day it is the simplest and easiest thing in the world for anyone to do it, but it means certainly a considerable amount of trouble if you are not doing it regularly.

2752. I presume if what would be in effect a legal standard were prescribed, the great producers of milk would more generally adopt some system of testing it, would they not?—They might, or they might not. I do not think that question enters into the dispute at all. I go the length of saying that if cows are reasonably fed you will have that standard produced under ordinary circumstances—supposing you never had a testing machine in your place, and you knew nothing about it, and had no idea of it in the world at all.

2753. You think a man doing justice to his beasts can safely disregard any regular testing of his produce?—Yes, with the exception that there may be abnormal states of the animals' health or some other circumstance which occasionally apparently turns up in the life of cows, causing the alteration—which I do not really properly understand—in fact, nobody apparently understands it at the present time. The appeal to the cow in every case would meet these circumstances.

2754. In your practice, of course, it is the mixed produce of a herd that you send away?—Yes.

2755. We have had it in evidence that the conditions of production are such that it is not possible to adequately mix the produce, and therefore that the standard conditions of milk must be fixed by a possible one cow giving a somewhat low limit of fat?—That does not exist in ordinary practice.

2756. I am glad to hear that it does not exist in ordinary practice?—In no circumstances that I have ever seen.

2757. You think there is nothing therefore in the operations of a dairyman which should prohibit his mixing his produce, and therefore giving a fairly average condition of milk?—The different churns as sent away may not exactly be an average of the production of the herd, but the variation will be so little that for the time being I think it might be left out of account altogether. The usual method in every dairy that has come under my notice—and they must be a very great number—is for those milking to empty each particular cow's milk into, say, a large carrying can. That can in the most of cases will hold two cows' milk, in many cases three, in some cases four; that when taken to the churn, and there emptied direct into the churn, as is the common practice in Scotland, or put over the refrigerator, as is the common practice with you, ensures at least every churn having probably from six to 10 or 12 cows' milk—more or less in that churn. You might not have the whole produce of eight to twelve cows' milk, but you have a portion of that number, probably the greater number.

2758. That is exactly what I wanted to know; you might, in fact, have a series of churns in process of being filled, might you not?—If there were any reason to suspect that a farmer, from his manner of feeding or manner of procedure, was likely to have irregular milk, it would then devolve upon him very much as a duty to see that he made such provision as was necessary for the mixing of it—for his own protection. As a matter of self-protection I think he would almost be entitled to do so. He might say, "I will milk the whole of my cows; take off a half gallon, and I will put all the rest of that milk into one or two churns." That milk would decidedly be under any standard that you are ever likely to fix, and yet he might say it is genuine milk. Within certain bounds of language it is genuine milk, but I do not think that this country is likely to legalise that at all, and if ordinary precautions are not taken by everybody I cannot look upon the milk as being milk that should be turned out without giving the man some blame for it at any rate.

2759. I see in your *précis* that it would be, you think, a great advantage to milk producers if they could have the instruments which they might use for keeping the high quality of their milk standardised by a central authority?—Yes. That has especial reference to the bottles that are being used just now in the three principal classes of centrifugal testing machines. Those bottles at least in one of the machines, and probably more or less in all of them, have a certain amount of variation. They are very useful machines, and the creameries in nearly every case purchase their milk on the basis of what these machines give. Now, these, it seems to me, might be Kew stamped, or any other way you liked the percentages marked on them might be certified as being correct. The capacity is a matter of no consequence; it is only a matter of the percentages. The moment that that is done the whole thing is correct. Just now I know there is considerable irritation between a large body of producers of milk and owners of creameries, who demand that they shall have 3·4 of fat in the summer time and 3·5 or 3·6 in the winter, and that a rebate shall be made from the price if they fall below any of these. The bottles that are used by these creameries have been submitted to accurate test time after time, and found to be most inaccurate; the Highland Society, in fact, had several of them sent to them quite recently, which were put under test by Dr. Aitken, and found to be altogether unreliable. Personally, when carrying out those tests I have filled each bottle with a certain amount of mercury up to a particular standard, by emptying the mercury from one bottle to the other I could see at once if there were any variations worth taking into account. Another way was to use the same sample of milk, and pass it through several bottles; if any bottle gave an abnormal result either high or low that one could be rejected, but when farmers are selling to a creamery by these bottles, on which a very large sum of money may depend, they have no control whatever, and it may even be to the creamery owner's advantage to use bottles that are inaccurate. I do not know that any creamery people are likely to do it, but in one instance I know that they resented the demand to have those bottles tested, which seems to me, to say the least of it, a little suspicious.

2760. (*Major Craigie.*) Referring for a moment to what you stated at the commencement of your evidence, that you are giving evidence first of all on behalf of the Highland and Agricultural Society, I think that they wish it to be clearly understood that you should advocate here a standard not under 3 per cent. of fat?—Yes, that is the fact.

2761. In their directions to you, did they refer also to the question of the non-fatty solids?—The question of the non-fatty solids did not come up. As you probably very well know, the average man is not so well acquainted with

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the non-fatty solids as those who have taken more interest in the subject.

2762. As regards the recommendation that you make to us for a still higher standard than 3 per cent. of fat; that is to be taken not as the view of the Highland Society as a Society, but as the result of your own very large experience?—Entirely; I give that on my own responsibility.

2763. And after the experience of those experiments of which you have told us?—I think I have done more in the sampling of milk, as I have occasionally said, than probably all the farmers of Britain put together.

2764. Can you say whether this question has been discussed pretty largely in the West of Scotland, in your own district recently?—It has caused a considerable amount of interest at the present time.

2765. Is there a concurrence of opinion among your neighbours of the same character as your own on the subject of a standard?—The opinion with regard to the average farmer is very various. It will be most difficult for me to say what would be the preponderance of opinion on that subject.

2766. You will understand that it is very important for this Committee that they should have a guide for some notion of what the general feeling in the matter is among producers; and perhaps very few persons would be more competent than yourself to say, speaking for your own district—I do not say for the country as a whole—how a suggestion such as that you made to us just now for a standard of 3·2 or 3·25, with some means of establishing the case against actual prosecution would be received?—The feeling of the country as far as I have been able to gauge it seems to be that they would agree to anything almost as high as you like, provided suitable provision can be made for any abnormal cases that may turn up.

2767. I would like to put one other question. Have you had the subject at all mooted at any of these discussions, whether it were possible to sell milk of more than one grade at different prices, according to its standard?—Yes, that subject was brought up for discussion by the late manager of the Glasgow Dairy Company, somewhere about two years ago, in Glasgow. He advocated the selling of milk of more than one grade—two or three grades, but I forget which just now. I may say that is the only time I ever heard it discussed.

2768. That is what was in my mind in asking the question; you have not heard that generally accepted or pressed?—No. Even on that occasion, while a special lecturer made the suggestion, which was followed by a very keen discussion, I do not remember of a single person, either a retailer or producer, having agreed to the suggestion at all, they thought it was out of place.

2769. Have you had any occasion to think of the question of a standard of cream as distinct from milk?—Yes; I have given consideration to that also. There is no difficulty in my mind in making a standard for cream; you may make that anything you like.

2770. What suggestion would you make to the Committee on that subject?—Not less than ten and not over 20 per cent. of fat. My reason for fixing it between these very wide figures is this, that in the southern districts cream is usually consumed, if you might so use the word, very much richer than what it is further north; it is used for a different purpose; when you use cream for the same purpose the same quality of cream is demanded in both countries, but then in Scotland we often use it for purposes that you people further south never do at all, and consequently they use in many cases cream there with much less fat. The householder while he is supplied, say, with fifteen or twenty per cent. of cream, can quite easily bring it down to five, or ten, or fifteen; he can easily enough put it down, but he could never put it up.

2771. (*Dr. Voelcker.*) The conclusions you have come to as the result of your very extended series of experiments have been pretty generally adopted, both by practical farmers and by scientists, as regard the influence of food upon the production of fat in milk?—I am sorry to say that is not the case.

2772. At all events the tendency is towards that?—The tendency is towards it only by those who you might say are keeping themselves very well up in their own business. The average milk producer is still under the impression that by giving particular foods he can alter his milk permanently either good, bad, or indifferent.

2773. I am referring, of course, only to those who have paid attention to the subject?—Yes; but most of those who have paid attention say there is not nearly so much in the matter of food as, ten years ago, everybody, even I myself, expected.

2774. There have been great diversities of opinion as to what constituents of food have affected most seriously the production of fat in milk?—Yes.

2775. And there has been a change of opinion?—Opinion is changing very rapidly at the present time.

2776. The conclusion that you came to was that feeding did not exercise such a great influence as was generally supposed?—That is so.

2777. You also came to the conclusion that difference of pasture did not make such a difference as had been alleged?—I expect that there will be some difference in pasture but probably more in regard to the quantity that is produced than in regard to the quality.

2778. The quantity rather than the richness of the milk is affected?—Yes. There is one very particular case which occurs to me just now, seeing that you have mentioned that. Several years ago a gentleman wrote me from the north of Scotland who knew that I was working on this question, and he said: "My dairymaid cannot produce butter from any quantity of milk at this period of the year every year." He could not get as much as to supply his own household from somewhere about three or four or five cows. I wrote him back; I said that it might be possible that the milk was so poor that it could not produce butter, and I asked him to send me first a sample of milk and then a gallon of the cream, and I would see what I could do with it. Contrary to the instructions he sent me the gallon of cream first, which I put one of my daughters to churn; she is a dairy instructress. I gave her instructions that as soon as it was properly soured she was to start at the ordinary temperature, and turn it for a quarter of an hour; if there was no appearance of butter, raise it about two degrees, and go on until she succeeded in making something of it. The temperature was gradually raised up, I think, to about 80 degrees, when the full quantity of excellent firm and well coloured butter was produced. I immediately packed up the butter and sent it off to the owner and told him he was to have the cream churned at whatever the temperature was, say 80 degrees. He wrote back that the butter was excellent, far better than he had been in the habit of having; but, he added, whoever heard of churning cream at 80 degrees! Then I wrote back again. I said I had heard of it, and I ask you to tell the dairymaid to try it. In another fortnight I got back word to say she could make butter now as good and easily as anybody. I then made inquiry for some of the milk, and he sent a sample of the milk, and that milk had over 6 per cent. of fat. I then made inquiry as to the feeding. It turned out that the cows were being fed on heather tops, they were going out on the hill and eating heather tops, with a little hay, and a very few turnips.

2779. Generally, if you were told that a certain procedure would produce milk and 3·5 per cent. of fat, and another one would only produce milk and 2·75 of fat you would be disinclined to believe it?—I would accept it with a grain of salt. When I had examined the milk myself, or had it from a source in which there was no doubt I would believe it.

2780. If an ordinary farmer, a milk producer, told you that off a certain pasture he could not send any milk to a town which he could guarantee to be higher in quality than 2·75 per cent. of fat, you would not be inclined to believe him?—I would accept it very cautiously.

2781. There are some foods, such as brewers' grains, which will affect more than others the amount of fat produced?—Yes.

2782. You mention in the first paper you refer to some exceptional cases; you mention that the fat may drop down to 2 per cent. or even as low as 1·5 for a few days?—That is in the case of individual cows.

2783. But you would not think of legislating on that basis?—Decidedly not.

2784. And you would not think it right that a farmer should send that sort of milk into a town for consumption would you?—I think that the farmer probably is entitled to send it, but he is only entitled to send it as one out of ten or twenty cows; if he has only one cow he may be entitled to sell it.

2785. If the cow is not unhealthy?—If she is not unhealthy. Where in one case 1·8 of fat was produced there was only probably half a gallon of milk, and that only exists for a week altogether; at the end of the week it has disappeared.

2786. You would not think it necessary to legislate for these particular cases?—Decidedly not.

2787. The results of your different experiments are all based upon evening's milk?—Yes; the evening's milk, I may remark, being produced after an equal time from the morning's milk—that is, the day being divided into two parts. There is a very great misapprehension with regard to the production of evening's and morning's milk.

2788. That is what I want to get from you?—Where the period of 24 hours is divided, as in some cases happens, into eight and 16, you will then get a very great variation between the evening's and the morning's milk, but if you divide the two into equal portions in many cases you will find the figures reversed altogether. I have had some cases in my own experience where really the morning's milk was the richest milk. If the day is equally divided into two equal periods, and no unnecessary disturbance is given to the cows during the day my impression is that the difference between the evening and the morning is a matter of very small moment.

2789. That is very important; but at the same time a farmer who is producing milk has to be guided very much by the circumstances of the trade?—Decidedly so.

2790. And you would not think of enforcing upon him that he was to milk his cows at equal periods?—Not necessarily at equal periods, but throughout the whole production of milk he must take reasonable precautions. It is very much in the same way, I should say, as if he feeds his cows entirely on grains, to the exclusion of every other food; I have no hesitation in saying he would then produce genuine milk very much under any standard you are likely to agree upon. So I say he is not taking reasonable precautions if he divides his day into periods such as that we have been talking of.

2791. You may say that you could insist upon his feeding his cows properly and not giving them an excess of watery food, but do you think it would be feasible, say, in the case of a farmer who was a short distance out of a big town that he should be obliged to send his milk in at certain hours, in order to guarantee the quality of the milk, apart from considerations of his customers?—I think so; he has to take the consideration of his own credit into account as well as the supply of his customers, and he must protect himself as well as the customers are protecting themselves by asking just now that a standard should be produced.

2792. But take the case of a man who sends the milk by rail some distance; the trains only go at certain times, and he has to put his milk on the railway at certain times?—Yes.

2793. The railway arrangements may be such that he cannot, with the best wish, divide his hours of milking in such a way as to produce that equality between the morning and the evening milk that you would advocate?—Unless the periods are made very wide and unless the standard is fixed very high—much higher than I have any anticipation you gentlemen are likely to suggest—there is sufficient of a margin to meet all these cases.

2794. Then taking extreme cases, have you anything from your experiments or from others that you have already to point to a figure that one might reasonably take as the difference which might be fairly expected between morning and evening milking?—It is simply a matter of difference in hours and of difference in disturbance.

2795. But you have no information you can give us as to what the difference would extend to?—The extremes are probably fairly wide if you are going to take extremes; but in average cases I think about 0·2 to 0·3 will cover nearly everything until you get a period of eight and 16 hours, and you then will get wider figures.

2796. That would be the extreme?—It might go up to 1·0, or even occasionally with particular animals they might even go more. It is very much a matter of the temperament of the animal. One animal with a slight disturbance may give a very big variation; another one with the same disturbance will give very little at all.

2797. You will understand that I am not advocating at all the setting up of a low standard; I only want to bring out these points in fairness towards the milk producer?—I am not taking the opinion that you are advocating that. I am answering the questions as far as I reasonably can in the way that you put them.

2798. Then you do not think it would be unfair in fixing the standard if you took the morning's milk into consideration—I mean the morning's milk alone?—I should think you should take the morning's milk alone into consideration.

2799. You must take into consideration that the supply sent into a town may be the morning's produce only?—Yes.

2800. (*Professor Thorpe.*) And your standard of 3 per cent. is fixed with reference to that fact?—Yes.

2801. Was your standard of 3·25 fixed with reference to that fact?—In the standard of 3·25 I said I was quite agreeable to that, provided you make suitable arrangements for an appeal—not for a prosecution to follow on 3·25.

2802. Quite so, but you had morning milk in your mind even when you suggested 3·25 with that qualification?—Yes, quite so.

2803. (*Dr. Voelcker.*) I need not take you over the question of the Ayrshire cows again; you would hold that any figure such as 2·75 would not adequately represent even the morning's milk of Ayrshire cows?—If I go back to Ayrshire and tell them that such has been stated here somebody will have to look out.

2804. In your tables you mention also the amount of total solids, and all your figures go well above 12 per cent., but you have spoken of the desirability of paying most attention to the fat; would you have any objection to a statement of requirements with regard to the total solids?—As you know very well the total solids are of very great value in coming to a conclusion whether the poorness of the milk has been brought about by the addition, it may be, of separated milk, the addition of water, or the abstraction of cream. The total solids are principally of value to the chemist.

2805. You have not anything from your experiments to show how the ash of milk or the nitrogenous constituents in milk may vary with feeding?—No; my experiments did not embrace that portion of the question at all.

2806. So I must not ask you anything on that. If a standard so low as 2·75 was fixed would it in your opinion tend to a great deal of adulteration?—Decidedly.

2807. And there would be much more harm done to the country generally by fixing a less standard than by fixing one of 3·25 and allowing the appeal such as you suggest?—Yes.

2808. Can you account from your own experience for the considerable difference of opinion that exists between the producers of milk and the retailers of milk as to the quality that should be demanded?—I suppose you would never anticipate anything else than that. I account for it very much in this way—that in all districts where there is even a moderate consumption of milk there is a very large consumption of separated milk, which in many cases disappears without being sold either as separated or as skim milk. How it disappears I am not exactly prepared to say; I allow you to draw your own conclusion.

2809. Is it your experience that the retailers of milk when they get their milk supplied to them by the farmers insist on any particular standard?—They never to my knowledge have insisted on any particular standard, but they always insist upon having the milk as it comes from the cow.

2810. Would it be anything very wrong that the public should insist that they have the milk as it comes from the cow?—I think the public are only doing a duty to themselves and a duty to the next generation and future generations by insisting upon the same.

2811. Do you see any reason for the adoption of a different standard for milk as it comes off the farm, and for milk as it is sold by the retailer?—There is no reason whatever to my mind why there should be.

2812. We have heard that milk as it is sent into a town may stand on a counter, and a certain quantity may be drawn from it, and if it is not always kept well stirred up that it will vary in quality, and the last lot may be better than the first, or vice versâ?—There is a certain amount of risk where small quantities of milk are kept in a vessel on a counter and retailed out in small quantities. I think this Committee would be quite doing justice to themselves to take note of that. What exactly is likely to be the difference between a sample of milk taken out of a vessel holding one, two, three, four, or five gallons at the beginning, and the last one taken out, I am not prepared to say, and I do not think there is any other one prepared to prove anything. You will have any amount of opinions as to what is the result; but whether or not they are reliable is quite a different

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story. I may give you what has been found by the Canadian Government. In order to settle this point in the retailing of milk off a cart going through the city, somewhere about eight or 10 years ago they sent from the experimental station in Ottawa some milk; they filled a particular vessel and sampled it properly, that is they took a sample before it was filled into the barrel, we will say; as a certain number of gallons were drawn off they took a sample just as it ran through, and they continued to do that at intervals until the vessel was empty. The cart passed over the ordinary roads and streets, I think, of Ottawa. They found that when each of these was analysed separately the difference was, comparatively speaking, small—very small—after somewhere about four or five hours' time, I think. That I account for from the vibration of the cart. In the case of a vessel standing on a counter where everything is quiet you have a different class of circumstances altogether to deal with, and it would depend very much on the manner in which the attendant dipped the measure into the vessel on the counter—whether she dipped it in such a way as to lift the top, when the last drop of milk would certainly be the poorest of the lot. If she dipped in without any precautions I do not know exactly what might happen.

2813. What do you mean by dip from the top?—If they dip so as to take any cream that might come from the top more than occasion requires; but I think that it is a precaution which dairy keepers must make some provision against in the way of instructing their attendants, the same as everybody has to take certain precautions in connection with their business.

2814. You think it would not be unreasonable to expect the retailer of milk to take such precautions that these differences do not occur?—They should be expected to take some precautions to meet that.

2815. But you would not advocate the material lowering of a standard in order to meet that?—No, I certainly would not. It is a very exceptional circumstance.

2816. (*Professor Thorpe.*) In regard to the milk which you said was tested over four hours, was that warm milk, or had it been refrigerated?—I cannot say just now. I am only speaking with regard to the Canadian Government test from memory. It might be to your advantage to apply to the Canadian Government for a copy of the bulletin in reference to it, and then you would get the full details. It happened somewhere about six to eight years ago.

2817. (*Mr. Barham.*) Where was it—in Ontario?—Yes, in Ontario.

2818. (*Dr. Voelcker.*) Do you say much adulteration of milk takes place on farms; I will not say in Scotland?—I have never been in a position of being able to give any information authoritative on that point.

2819. You would not consider it legitimate of a farmer if he knew that he had got rich milk to skim a part of it off, or add water to it, and so send it into a town?—There is not the least doubt but it happens more or less. You see from the public prints that it happens occasionally with farms the same as it happens with our people.

2820. The fixing of a low standard would give a greater inducement to that?—Decidedly so.

2821. You have sent milk yourself into towns, I believe?—I do.

2822. Have you ever had any trouble with prosecutions?—I have never had any trouble, and what is more for some years I have been supplying the Corporation of Glasgow, who have officials taking samples—I have no idea how often, but I know occasionally the man says to me a sample of milk was taken to-day. I have never heard more of the subject at any time.

2823. And you never feel any uneasiness with the existing standard?—I would feel no uneasiness even supposing it was put higher than I have suggested.

2824. Have you any trouble with analysts?—I have had no trouble with analysts.

2825. A good number of the differences occurred in Scotland, I believe, did they not?—These differences are likely to be more in the methods that may have been employed by different analysts.

2826. Do you mean to say that some of them are rather forced by the exigencies of competition and time to adopt quick methods?—Decidedly.

2827. And they probably have some of these variable bottles have they not?—Just as likely as not. But it might be worth the Committee's consideration, if a standard were suggested, that public analysts should be asked to adopt certain methods recommended by the Society of Analysts—and only certain methods.

2828. Would you advocate uniformity of method?—Not exactly uniformity. I know that in the analyses of several substances there are particular methods which are always known to give higher results, and other ones which give low results. There are other methods which are known to be quite different, and to still give practically speaking the same results.

2829. There is something of that kind existing already?—I am not, of course, a member of the Society of Analysts, and I do not know, but I may be making a mistake.

2830. You are advocating here, and I quite see the force of your point, that there should be some system of certainty in regard to the graduation of these bottles which are used for those quick analyses; but I suppose you never heard of a prosecution being determined, or otherwise, by any quick method such as this, have you?—I have made the suggestion not from the prosecution point of view at all.

2831. Simply in fairness to the farmer as between the farmer and the creamery?—No, but simply from the point of view of the Government, saying that every weight and measure shall be stamped. It is as a business transaction between buyer and seller. There is much more necessity to have these bottles stamped than there is to have a cart weighing machine, which you can stamp this hour and you can have it unreliable the one following.

2832. They should be sent out tested?—Yes; and in fact no bargain, no commercial transaction, should be founded upon it at all unless a tested bottle has been used. There are thousands of pounds depending upon the accuracy of these bottles at the present time, more especially in two counties, Wigtown and Kirkcudbright, and the mere matter of one-tenth per cent. of inaccuracy is causing these men there on the one side or the other to either lose or gain a very large sum of money.

2833. These bottles, in Scotland at least, have taken, in a very great measure, the place of the analyst, have they not?—Not at all with regard to what may be considered prosecution; it is only, as a matter of commercial dealing that they are used. I do not think that the rapid systems have in any way taken one iota of the work out of the analyst's hands; in fact, I am rather inclined to believe that they put work into his hands, because they have given a great many people an interest in, and a knowledge of, the production of milk who previously, owing to the cost, would take no trouble to look into the matter at all.

2834. (*Mr. Cowan.*) You have told us in connection with your feeding experiments that after a period of 20 days or so the quality came back to about the normal, is that it?—No, it did not come back until about five weeks. If it was a highly albuminous food it usually went up the hill for about two to three weeks; if it was a very starchy food it usually went down the hill for about the same time, and at the end of about five weeks or thereabouts it had come to very near the normal.

2835. May I ask if it would be the case even with continued high feeding that it would keep to the normal after that date?—My experiments were not carried on further than five weeks, and I am not prepared to say what would happen after the fifth or sixth week. The presumption I have drawn from them is this: that if you get back to what was the previous normal at the end of five weeks, you are likely to remain at that.

2836. Even with the change of feeding?—That is so.

2837. You have not found a change of feeding give better results, have you?—The change of feeding gives better results for from two to three weeks, but the next two or three weeks it came back to pretty near what it was before.

2838. Then from your investigations of feeding have you found that the milk of cows that give naturally poor milk can be much enriched by continued high feeding?—No, there was not much difference in that.

2839. Not much difference?—No; the cow that was good to begin with remained in much the same condition all through; the one that was comparatively speaking poor, was in much the same condition at the end.

2840. Then in that case you would not consider that feeding would improve the quality of the milk from cows

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that naturally were not inclined to give a good quality?—It would not improve it very materially at any rate.

2841. You speak of having known of milk being adulterated. Perhaps you answered the question to Dr. Voelcker, but I was going to ask whether it was generally done by the producer or the trader, in your opinion?—As I have said before, I have not much experience as to what producers do. I happen to have been a supplier of a good number of retailers—retailers on a large scale I may say—during the last 25 years; and in no case did any of these ever retail the milk they got in the condition in which it was supplied. I know that for an absolute fact.

2842. (*Chairman.*) Do you know that for a fact?—I know it for an absolute fact in the case of everyone that I was supplying.

2843. (*Mr. Cowan.*) You found that the milk that you had supplied to the trade was reduced before it got to the consumer?—The way it is done with regard to what is called the morning's milk in Glasgow—that is, milk which is delivered off the farms by the farmer's cart—is this: He is asked to take off all the cream of the evening's milk which he supplies separately—they usually ask that about one gallon of cream shall be given off from four to five of milk. That will give cream of something like off and on about 10 per cent.—it may be a little below it, or it may be a little above it, according to the carefulness with which it is taken off. The cold skimmed milk which is sent in is, I think, almost in no case sold as skimmed milk. It is usually mixed in some other way; generally with whole milk in the most of the cases it is also coloured; in some cases even further sophistication, if I might so express it, goes on.

2844. You are speaking, of course, about Glasgow?—Yes.

2845. Not of any other town that you know?—Practices of that kind usually do not confine themselves to one limited area; it is wonderful how a little information leaks out and spreads from one to another, and while probably statements of the kind should not be made too strong as being too general, still you are quite at liberty to draw your own conclusions as to what will happen elsewhere.

2846. In your evidence you seem to me to give much more importance to the question of the fats than to the question of the solids; now may I ask what is your experience in connection with the solids; did they rise in proportion to the rise of fat throughout your feeding experiments?—They usually more or less follow the fats or the fats follow the solds; I do not know—you can put it either way you think fit. If you have a very high percentage of fat you may always, I think, depend upon having a somewhat similar rise in the other solids. My results come out almost identical with that. The variation in the solids is very much less than what it is in the fats, but still the one more or less follows the other.

2847. Would you consider 3 per cent. of fat would give as much as 9 per cent. in solids?—Yes, I think I would.

2848. It would not be out of proportion?—It is not out of proportion. I am quite sure without referring to my own figures that I have 3 per cent. of fat in certain cases and have 9 per cent. of solids.

2849. I think from what I have read in your books that you have always shown more than 3 per cent.?—Yes, but you could have quite genuine milk and still be under mine.

2850. That 3 per cent. of fat?—Yes.

2851. You would have, I think; have you had much experience in connection with separated milk—personal experience, I mean?—In what respect do you mean?

2852. Do you use a separator yourself?—I have never used a separator unless in carrying out these experiments. The milk is sent in whole.

2853. In our part of the country there are very large quantities of separated milk sent from the creameries into such towns as Glasgow; what becomes of it?—I have given you a hint as to what becomes of a portion of it. It certainly comes not in large quantities, but I would say in extraordinarily large quantities into Glasgow, and it is one of the biggest bugbears that the ordinary milk supplier finds in the trade. I am quite satisfied that if it were possible to put the sale of separated milk under proper restrictions it would be very different both for the producers of it and for the producers of the full milk.

2854. I have heard it stated that a great quantity of that separated milk which goes into Glasgow is used in the manufacture of ice-creams and condensed milk; have you any knowledge of that?—Yes, there is a portion of it used in that way, but that is a very small portion of what comes into Glasgow; what comes from your own counties must be 10 or 20 times more than all the milk that is consumed in the making of ice-cream in Glasgow, and, strange to say, the biggest quantity of it comes to Glasgow at the time when no ice-cream is made at all—in the winter time.

2855. Can you give us any information as to the quantity of separated milk that can be detected by an analyst in full milk?—I am not prepared to answer that question unless you give me special figures.

2856. Where in your opinion should the responsibility of the milk producer cease?—When the milk leaves his possession.

2857. Do you mean when it leaves his steading or when it arrives at the railway station?—If it is in the possession of himself or his servants I say he should be responsible; if it is out of his possession or his servant's possession I do not think he is responsible.

2858. But is it not the case that he is held responsible now even after it leaves the station of delivery?—I do not know that it is. I am prepared to say that if anyone tries me upon the point they will find a pretty hard nut to crack.

2859. I do not think that you could prevent a prosecution by holding that idea; in the meantime, supposing your milk was found deficient when it went into Glasgow, say?—I would give them some trouble as some others have done.

2860. Still it is your opinion that the responsibility of the producers should cease at the station of delivery?—No, I am inclined to go a little piece further. I think that all cans that are passing out of the farmer's hands should be lead sealed.

2861. But you are aware that the railway companies in many cases have objected to having the cans sealed, are you not?—I have heard it mentioned as in an offhand way a year or two ago in Essex that the railway companies would not permit it, but I have not found it in my own experience. For several years I supplied one of the infirmaries of Glasgow, and the milk always went with the train, and every can was sealed, and I never was asked to take off the seals.

2862. Then in such a case you would allow the responsibility of the producer to go on until it arrived at its destination?—I would allow the responsibility of the producers to go on until the seal was broken; if the seal was broken I say his responsibility would end.

2863. (*Chairman.*) I would like to ask with regard to that particular consignment of milk to the Infirmary, whether they were all full churns?—There were several churns which would not be all full.

2864. That apparently has been the difficulty with the railway companies?—My vessels are of several capacities; there were a certain number filled to their full capacity, but the quantity varied in proportion to the number of inmates in the Infirmary. If I had a churn, if you may so call it, suitable in size to take the extra over the other ones, it would be filled to the top, but that would very seldom happen, and there would be always, I think, one vessel in each consignment which would be partially filled.

2865. (*Mr. Cowan.*) If a standard should be fixed at whatever it might be would you consider that if the milk was added to by separated milk to bring it down to that standard, that it would be adulterated?—It certainly would be adulteration, but I do not think that you would be justified in prosecuting the person who carried out the adulteration, if you make a legal standard.

2866. Then you would allow the producer to bring it down in that case?—He might as well bring it down as any other body bring it down.

2867. At the same time the consumer would not be getting genuine milk from the cow; how would you get over that?—That is quite a different question altogether.

2868. But how would you prevent that? In connection with what you have stated about an Inspector being suspicious as to separation, the milk that he had taken not being genuine, I think you spoke of finding it rather a difficult matter in getting the analysis; you would wish the analysis to be got, say, within 24 hours of the time?—48 hours I have said.

2869. Or 48 hours?—If possible.

2870. I have found cows varying so much between one day and another that even then it might not be a fair analysis?—If you are dealing with individual cows the second analysis would mean little or nothing; but when you are dealing with the milk, as it is ordinarily bought and sold, the same difficulty does not occur at all, you have very little uncertainty to meet there.

2871. But would you not get over that difficulty by allowing the inspector who is suspicious of a milk coming from a certain place to go down at once and verify his suspicions or otherwise?—That is a matter of procedure for those who have the control of whatever might be the regulations you adopt.

2872. That would be an easy matter?—I do not think it is without the powers of man at all to make regulations that would be equally suitable and just for everybody.

2873. I would like to ask you at what time of year you have generally found cows giving the poorest milk. From the evidence that has been brought before us it seems to vary in some districts?—With me the poorest milk on what you might call unmanufactured food—the more natural food—has always been the first week or so that the cows were on grass. That I have attributed to apparently the power of new grass (the same as the power of grains) to stimulate the milk glands; and so you get a poorer class of milk for a week or a fortnight or a month, not through really the effect of the food, but, I think, more through the enormous quantity of water that the food contains. It seems to me to be much more a matter of water than one really of food. That is only a question of opinion, of course, and I have no definite proof of that, and it will not be very easy to get proof on that particular point; but certainly with me the first week or two on grass has usually been the poorest.

2874. I suppose it will not vary quite so much where cows are calving at all seasons of the year?—That is a ticklish question. There is this—I think that if the cows were newly calved and put on the pasture immediately afterwards you might have very little fall in the quality of the milk. My experience is altogether contrary to the popular opinion that a cow immediately after calving has very poor milk—the poorest milk that she has. During the first series of these experiments and during ones carried out for a year in 1893 and 1894, when each individual cow had the milk tested separately, every newly-calved cow gave the richest milk the first week after she calved; about the second, or third, or fourth week she dropped down pretty quick to what you might call her normal point, and from that she gradually moved up until nearly the drying period; the week before getting dry it then would drop away at a triple speed again.

2875. You said to Dr. Voelcker that there was a very great difference between the quality given by a cow on a certain day, and the quality when tried the following day, but you did not give the reason for that; was there anything abnormal about it?—You will have that happen occasionally at a time when a cow is in season. When she is taking the bull you may have milk given from one single cow for one or it may be even two milkings, which is not normal. In my experience I have had one cow which dropped on a particular evening as low as 1·8 or 1·6.

2876. 1·75 is the figure, I think?—Well, but that is an individual cow; you never have the whole herd of cows getting into season at one time, and I do not think it is worth taking into consideration.

2877. We have had a good deal of evidence laid before us in regard to the difference between morning and evening milk, but you seem to say there is really no perceptible difference if the cows are milked at an equal interval of time between the milkings?—There is a little difference apparently caused by the irritation of people going backwards and forwards amongst the cows during the feeding times, or by the feeding probably being irregular; but if you have animals that are thoroughly accustomed to their attendants, and there is no unnecessary interference, and you divide the day into two equal periods the difference in quality is so small that you will occasionally find it turn the reverse way.

2878. You are aware that in the part of the country from which I come the cows are milked, at equal periods of time, say, at 6 in the morning and 6 at night?—My experience up till a few years ago was that it was always done in that way, but I find that the exigencies, if you may so express it, of a large city are now demanding something different.

2879. In our country, of course, we are so far from a large city that we have not quite gone with the times, and we are still milking, say, at 6 o'clock in the morning and at 6 in the evening; I was going to state to you that even milking in that way I have found a considerable difference in the analyses of the morning's milk, and of the evening's milk—a difference, say, of from a half per cent. to 0·75?—That would be the extreme. Then I am always suspicious of any statement of that kind being made unless the person making it is something more than usually accustomed to the taking of samples. A great deal depends on the taking of samples—far more, I believe, than on the analysts themselves. No one else has devoted more attention to that subject than myself, and I will not be in the least surprised to find that probably the inspectors have in many cases taken samples very carelessly.

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2880. You think, in that case, it is no more than a popular belief that there is much difference between the morning's and evening's milk?—Where the conditions are favourable to the production of milk the difference is infinitesimal; I have said so already. I even go further: I say this—that if you take cows, as happens in your own district, where they are in the field both day and night, the conditions are very much the same if they are back, say, from a public road, and suffer no interference, and the weather is not too warm so as to make it unpleasant for them during the day; but you might find things turn out altogether different if you have a coarse night—a cold night—you will probably find the worst milk at night and the best in the morning; turn the circumstances about the other way, and you will have it as you said just now.

2881. I have just one other question to ask you, and that is about cream; you seem to fix a very low minimum for cream—I think you said 8 per cent.?—No, I did not say 8 per cent.; I said a minimum of 10 to 20 per cent. I am sorry to say that when I get my dinner or luncheon in a public restaurant in Glasgow, and I have dessert, with which in Scotland we usually have cream served, I do not get cream of 10 per cent.

2882. Would you think that was a high enough minimum?—If you are going to give a food in its best condition for the particular purpose for which it is used, I should certainly say it should be 15 per cent.; if you make it 15 per cent. the householder can easily have it 10 or 5 per cent. by adding a little ordinary milk to it.

2883. (*Mr. Barham.*) With regard to the imputations that you have made upon the dairymen of Glasgow, is it not the fact that there is a great deal of butter-milk sold in Glasgow?—There is.

2884. Would the ordinary consumer, if he bought separated milk lappered be in a position to say whether it was butter milk or not?—I think so.

2885. How would he distinguish the difference?—Between butter milk and separated milk?

2886. Of course, when I say butter milk, I mean butter milk from whole milk churned; that is what is sold, I believe, in Glasgow, as butter milk?—The two have quite a different taste. You might as well say, how would you know the difference between a pear and an apple, or a pear and a plum—simply by taste and by sight.

2887. If in the summer you have separated milk which is three days old, would you be able to distinguish the difference between the taste of that and of lappered milk?—I have no experience of distinguishing separated milk that is three days old.

2888. You could not say that there was as much difference between them as between a pear and an apple?—No.

2889. You could not say that at all?—If you put it in those terms I cannot give you my opinion at all, because I have no experience of them.

2890. Then it is not right to say there is as much difference as between an apple and a pear, because you do not know that as a fact?—I have never seen it to my knowledge, so I cannot give an opinion.

2891. Are there not some very important bakeries in Glasgow?—Yes.

2892. Do they not use a very great deal of separated milk?—They use some, but the largest bakery to my knowledge using from 800 to 1,000 gallons of milk a day always have the very best quality of milk that they can possibly get, and the man who supplies it, and who has supplied it for 10 or 20 years, is one of the most careful buyers of the whole lot.

2893. Still there is a great deal of separated milk used in Glasgow for bakeries?—I do not know of my own knowledge.

2894. Is there a very large biscuit bakery there?—The biscuit people use whole milk.

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2895. Do they entirely?—It was a biscuit factory that I was referring to when I spoke just now.

2896. Entirely whole milk, is it?—It is.

2897. Large biscuit bakers in this country, you know, use a great deal of separated milk, and I should have thought the same would have held good in Glasgow; I believe it is the same in Carlisle, where there is a large biscuit factory?—I do not know that; it might be worth your while inquiring at Reading what Huntley and Palmer's people use there.

2898. They are not in discussion at all?—No; that is outside of the inquiry, but it would be probably useful for your own information.

2899. You have told us about the quality of milk that the Ayrshire cows give. Would you mind telling us about what quantity they give?—The quantities are mentioned in my pamphlets.

2900. You can tell me near enough without referring to them?—It is entirely regulated by the stage of lactation.

2901. Exactly; but I mean the average; what would that be—10 quarts a day or 12 quarts a day; what would it be, think you?—It depends altogether on lactation.

2902. You know what your own cows average, for instance, I should think?—But there are so many circumstances to take into account and really the question has nothing in it whatever; it means nothing, and I am surprised at your putting such a question.

2903. Then you do not know the average of what your Ayrshire cows give?—The average per day?

2904. Yes?—I know what milk I have, but the question I say means nothing at all. If you put it in this way—how many gallons of milk does an average Ayrshire produce in a year, I will answer right off.

2905. Very well, we will have it in that way if you prefer?—They will produce from 450 to 750, according to the animals and according to the food supply.

2906. That is about two gallons a day?—Roughly speaking.

2907. When they are out on grass I suppose they give a great deal more than they do at any other period of the year?—Naturally so.

2908. I suppose to make this average you get a larger quantity at one period of the year than you do at another period?—In most of the dairies they have not all their cows calving at one time.

2909. Just so, but still the larger quantity you have in the summer time when the cows are out at grass, I take it?—In my own dairy the largest quantity is when they are not there.

2910. Anyhow, there is a larger quantity at one time than at another?—Taking all the country over, there is.

2911. If they give two gallons a day as an average through the year, I take it that on many occasions the quantity would be up, say, to 10 quarts a day or 12 quarts a day?—Yes.

2912. When you get the biggest quantity you might get sometimes an average of 10 quarts or 12 quarts a day?—It is not a heavy milking cow at all which will give 25 lbs. of milk after calving; some will give 35.

2913. What size are the churns that you send the milk away in?—Mine are eight-gallon churns.

2914. Eight Imperial gallons?—Yes.

2915. So that if a cow gives 12 quarts a day, and she gives seven quarts of that in the morning, it would take about four cows or four cows and a half to fill one churn?—Yes.

2916. Do you mix the whole of your milk together in one large vessel?—No.

2917. I did not understand that you did so?—No, I do not do so.

2918. You milk the cows indiscriminately, I take it; the man milks one and fills one churn, and goes on and fills another churn, and so on?—It is emptied into carrying cans, holding about five gallons apiece in the byre.

2919. Exactly, so that in a churn that holds eight gallons you would probably have the milk of, say, four cows or five cows, or it might be six cows possibly?—It is scarcely possible to have four cows alone.

2920. Well, five cows then. I am not particular to have four?—It might happen in this way, that a man in carrying in a can might empty that can entirely into the previous churn, you understand, and then start to fill up a new one with an absolutely full can. In ordinary practice you will find that when he fills up, say, can No. 1, he has probably half a can or a quarter of a can left. That quarter of a can may contain a sample, or will contain a sample of at least four or five cows, so you see there is a portion of the milk of four or five cows put into can No. 2. Supposing he then came with another full can, which would contain the milk of also four or five cows, there you would now have the milk of ten cows, and still your can would not be full; you would still have another one that would have to be brought in.

2921. How much would your cans hold?—From 8 to 10 gallons.

2922. What sized pails do your men use for milking?—For milking, or carrying the milk?

2923. For milking?—They hold about 2½ gallons.

2924. They milk one cow into that, I suppose?—Yes.

2925. Then they pour it into the larger can?—Yes.

2926. How much does the larger can hold?—It holds five gallons.

2927. If your men went to an empty churn they would pour the whole five gallons into it?—Decidedly.

2928. When they come with the next full can they would pour three gallons out of that can to make up the contents, and the remainder would go on to the next can?—The remainder would in that case.

2929. So that practically it all comes to this, that, as I say, you get the milk of five or six cows?—In no circumstances would you have the milk of five cows at all; you could not possibly have five cows' milk even in an eight-gallon churn.

2930. I think I have got sufficiently near to it for my purpose. We have had it in evidence here that the cows varied to the extent that, say, 15 per cent. of the cows will give less than 3 per cent. of butter fat; now, if your five cows, or six cows, or seven cows fill a can it is very clear to my mind that you may get the milk of seven poor cows, or seven cows, giving poor milk into one can?—You might.

2931. It might occur so; I do not say it would in the ordinary course, but it might, anyhow; you take no steps to mix the whole of your herd; you are speaking about averages, but you do not send your milk away of that average quality, and your cows must vary one from another—at least I presume you will not dispute that for a moment, and although the whole is mixed you cannot get exactly the average of the whole of it in any one can, can you—some will be more, and some will be less?—I have stated already that I do not believe that anyone taking one can of milk can say that each can is exactly an average of the whole of it.

2932. Exactly?—But I say that milked under ordinary conditions the difference is likely to be small.

2933. Now, then, you say the feed has an influence, although not to such a great extent as a great many of us have supposed; you have also told us that where cows are heavily fed on grains, or on any other food, that will produce poor milk, the farmer ought to be punished for producing that poor milk; he must abide by the results, I think you have said. Am I right? I do not want to mislead you or to lead you in a wrong direction; I only want to know if that is your view?—Put the question in your own way, and I will answer it in my way.

2934. Very well. You have suggested that we should refer back to the byre?—I think that the person responsible is the person selling for the time being.

2935. You have suggested that in order to prove the purity or the adulteration of the sample which the analyst may obtain from the retailer, reference should be made to the cows themselves?—Yes, decidedly.

2936. You have also told us that milk may be produced of a very poor quality by feeding the cows largely on grains?—No. The poorest samples that I gave you here were with cows that were to all intents and purposes fed almost entirely on grains.

2937. Exactly; that is so?—To get an extreme result.

2938. That is so?—They had nothing else but grains, and a little grass—as much grass, as a rule, as would keep them in health for five weeks.

2939. Yes, that is so, then. What I want to say is this. Supposing that the farmer, when the inspector comes there to obtain a second sample to match with the first one, or to compare with the first one, should feed the cows heavily on grains, is there anything to prevent him doing it?—Nothing at all.

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2940. Would you consider that a fair sample of milk to judge the other by?—No, I would not.

2941. How would you prevent it?—I say I would no more look upon it as being a sample of genuine milk than I would look upon the first five pounds that came from any of his cows. It is not whole milk.

2942. Exactly; but then how would you prevent it. Would you have the inspector go down there and live at the place for 24 hours beforehand?—It is not to the farmer's advantage to do so; it is to the farmer's disadvantage to take the course that you have suggested, and not to his advantage. As far as I understand it, you are putting the thing in the reverse way.

2943. I do not know whether his lordship sees what I am trying to bring out; I mean, there is nothing, I was going to say to fence with, or to try to prevent me from ascertaining; I think it is all very clear what I want, and I think you would endorse it?—Allow me to put a question so that we may understand each other.

2944. I must put the question. You say you will answer in your own way, and you must let me put the question if you will. I am supposing that a farmer sent in poor milk to the retailer, that the retailer sold it in the same condition in which he has received it, that the inspector ultimately goes to the farmer to obtain a sample, and that the farmer might have skimmed the original milk?—Yes.

2945. You have said already that you know several farmers who have done so; or you have heard of them at all events; he may have skimmed the original milk, and then it is his object to produce a poor sample of milk?—Yes.

2946. He would naturally feed his cows on grains, or something that would produce a poor sample?—Yes.

2947. Would he not?—He might.

2948. You would reject that sample, because you say the cows were improperly fed?—If it was carried out to extremes I say you would be entitled to reject it.

2949. How would you ascertain that he had fed them in that way; would you have an inspector to go down 24 hours before hand, and see how the cows are fed?—I do not think that the inspector has anything to do with that at all; he allows the farmer to take the chance with regard to that; that is his look out.

2950. Then according to that you would not restrict the farmer in any way should he feed his cows at all badly?—Not at all; I am quite prepared to say that.

2951. We have had it stated here several times that even although the milk might be pure from the cow, if the cows were improperly fed the farmer should be punished just as much?—I do not think so.

2952. You do not advocate that?—I do not go at all that length unless the milk falls below 3 per cent. of fat.

2953. However the original milk might have been produced you would be quite satisfied, and you think it would serve the justice of the case if the farmer fed his cows as poorly and as badly as he could in order to produce a sample for comparison?—Yes. In making my recommendation I said that you should do it within 48 hours if at all possible. In 48 hours that effect cannot be brought about, because every cow has about two or three days' food in its stomach, and the previous feeding has an effect for that time.

2954. That is another point altogether. Of course, the question arises whether it can be done in 48 hours; if it cannot then your reference would go, and you would not think it would be of much value?—It is simply because it cannot be altered in the 48 hours that I say it is of value; and it is necesary that it should be carried through.

2955. I mean this, that if we cannot refer to the cow within 48 hours then you would not think the reference is of very much value?—It is not of so much value then.

2956. Exactly. I think you said that where cows were milked at intervals of eight hours and 16 hours the difference would be about 1 per cent. of butter fat?—No, but that it might be.

2957. What does "might be" mean; of course, it might be anything? Do you mean that it would probably be that or pretty near that?—No, that you might find cases where the difference would not be more, but would be less than the half of one per cent., and you might find other cases where it might be——

2958. As high as 1?—1 per cent. or more.

2959. We may take it that the average of the difference between the two—we are dealing with averages—would be three-quarters of 1 per cent.—0·75, if the difference of the intervals between the hours of milking were as great as eight hours and 16?—It would run to something like that—at least a half per cent. at any rate.

2960. Now, these cows that you have been experimenting with apparently were milked at intervals of 11 hours and 13 hours. Am I right in that?—That was during the first portion of the experiment, but I think not in the second.

2961. That appears in one of the books that you put before us as part of the evidence that you are giving today, and what your evidence is based upon?—Yes; that is in the first series.

2962. There is a difference of two hours between the two intervals?—Yes.

2963. That is one-fourth of eight?—Two hours makes one-twelfth of difference.

2964. The difference between your milking at intervals of eight hours and sixteen hours will produce about an average of 0·75 difference in butter fat. Now, the difference between these milkings was two hours, that is a fourth of the difference of the eight hours, between the eight and the sixteen?—Yes.

2965. And therefore we may assume that it will make that difference of one-fourth in the butter fat?—It might; it depends altogether on the disturbance, if nothing else.

2966. May we not take it that if eight hours makes a dfference of 0·75, two hours would make a difference of a fourth in that amount?—It is not altogether a matter of difference. I have given my opinion that the difference in the period of milking is the most important factor; but there are other factors which influence it as well as the one of the period of time.

2967. It must exactly be so. Of course, there is the factor of the atmosphere—of its being a hot day and the cows running about the fields, or of its being a cold night, perhaps, and the cows getting chilled with the cold wind, and all that kind of thing?—Yes.

2968. We have got an average difference of 0·75 per cent. between the two meals, and it is upon that average I am asking you the question I have asked you. We are not on any alterations of food or any alterations of condition, but we are on that average of time?—If you take the one influence, certainly it would be in the proportion that you state.

2969. We may take it like that; very well. Your butter fat here apparently, when your cows were out at pasture, showed an average of 3·52. That is given on page 7 of your first pamphlet. I have only glanced at it here, and I have not had time, I am ashamed to say, to look through it. It is headed "Period I.; Pasture"?—Yes; I have it.

2970. Your average there is 3·52 of butter fat?—Yes.

2971. And if we reduce that by a fourth of the 0·75 it will bring it down to 3·30?—Yes.

2972. That is fair for the morning's milk?—If I am correct in saying that the 0·75 would meet this particular case.

2973. Yes; that is what it is. We have had it before us. You do not want your evidence to be wrong. You are a sufficiently strong witness, I am sure, that it varies from 0·50 up to 1 per cent. Two or three producers have said that?—I know that for a fact.

2974. (*Chairman.*) We have had cases of it being still higher, but they are abnormal cases?—Yes, they would be so.

2975. (*Mr. Barham.*) So that reduces your butter fat to an average of 3·30?—No; that reduces the minimum to 3·30—not the average.

2976. That reduces the average of butter fat to be found in your morning's milk to 3·30?—Yes, that is correct.

2977. If you have an average of 3·30, I take it that a great many of your cows must be below 3·30, or else you could not get the average of 3·30, could you?—That goes as a well-known axiom.

2978. Exactly. How, if that is the case, can you possibly come and suggest to this Committee that producers should be prosecuted if their milk does not contain 3·2 of fat, or 3·25?—I have not made any suggestion of that kind at all.

2979. (*Chairman.*) I understood the recommendation on this point was that if it did not reach that, then there should be a reference to the cow?—Yes.

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2980. (*Mr. Barham.*) I beg your pardon. I think you are quite correct. At all events, your recommendation was that unless a farmer produced milk, or the retailer, in other words, sold milk containing at least 3·25 of butter fat, he should be called upon to explain why his milk was so poor, and that the farmer and everybody concerned should give an explanation, and allow a reference to the cows?—Yes.

2981. And you still advocate that in view of what I have said that many of your samples—as you say it goes without saying that one-half of your samples—of the morning's milk must be less than 3·30?—I beg to direct your particular attention to it that there are only two classes of food out of 20 that could bring it down, even with the reduction that you refer to—that is, one-tenth rather than one-half.

2982. These cows were out to pasture?—Yes.

2983. And that is a class of feeding that is very general throughout this country, and in Scotland, and everywhere else?—Yes; but you said one-half of the samples in my experiments.

2984. No, I did not mean that?—Do you mean one-half of the samples on the pasture?

2985. I mean one-half in this particular experiment?—That is quite different.

2986. I referred to it, if you remember, as on page 7, under the head of "Period I; Pasture"?—Yes; that was previous.

2987. Anyhow, that is clear, is it not?—Yes.

2988. About one-half of the samples of the morning's milk must be less than 3·30; yet you advocate that 3·25 should be the standard upon which the milk should be judged, or, at all events, the standard below which the farmer should be called upon to prove that the milk was pure?—Yes.

2989. I do not know whether you have thought it out. You have made one or two suggestions with regard to the way in which milk samples should be taken; but do you not see that there would be a great deal of difficulty and expense in connection with a trial of that kind?—Of course, your circumstances are different to the circumstances under which milk is sold in large towns to a very great extent. For instance, we in London have had milk from as far as Scotland in scarce winters, you know, and that sort of thing?—Yes, I understand.

2990. Do you not think there would be a great deal of difficulty and expense in sending the public authorities down to have the cows, say, milked in Scotland, which supply milk to London; some one would have to incur that expense?—Decidedly.

2991. And in a great many cases it would be an addition to the fine if the farmer could not prove that his cows gave milk of that quality?—There are other ways of getting a sample than by sending a man directly from London. It would be an easy thing to telegraph to the responsible parties in the district—say, to the sanitary officer or any other officer. He could have these milked the very next milking for that matter, and proper samples taken.

2992. That is not at all a bad idea, if there were a staff of officials all over the country to be able to do that. That would certainly meet the case to a very large extent; but, of course, that represents a great difficulty in getting a staff of officers all over the kingdom ready to deal with a case of that kind?—The machinery must be got into order to do it in some way, and it lies with the authorities to devise the easiest and best class of machinery possible.

2993. If the cows were tested, and the milk of three cows was sold, you suggest that the opportunity of appeal should be down as low as 2·75?—Yes.

2994. So you could not fix a standard above 2·75 in a case of that kind?—No.

2995. Now, you were speaking about Denmark. Are not things totally different there to what they are here, I mean in the way in which milk is bought and the way in which it is tested? You see, the milk that we have to consider is the milk that reaches the consumer, the milk that is sold in a large town, whereas in Denmark, I think, what you refer to is the milk that is supplied to the factories and creameries. There is a committee attached to that factory or creamery that can obtain these samples and see that they are properly dealt with, and see that they are sampled in the proper way?—The milk supply of Copenhagen, which is probably the best of any town that we have in existence, comes into Copenhagen in very much the same way that it comes into London. The best and largest company there get the supply by rail very much as you do yourself, and they keep a control over it which could be equally well done by you or anyone else if you choose to go to the trouble and expense.

2996. They copied their system from London to a very large extent?—Well, I do not object to that.

2997. Do you know that they sell their milk very largely in bottles?—Not very largely in bottles; there is a proportion of it sold in bottles, but it is not all; I do not suppose it comes above a quarter at the extreme. I am only speaking from memory—I can get it for you—but I do not think it is more than a quarter at the outside.

2998. I will accept that. You know that there is a man there, I forget his name for a moment, but I think he married a Scotch woman if I remember right, and you, perhaps, recognise him from that fact; do you know whom I mean?—Yes.

2999. He puts milk into thousands of bottles, and you can see it going on all day and all night; you know that, do you not?—Yes.

3000. Is there any mark or anything else on those bottles for the public to ascertain where that milk came from?—I forget at the present time.

3001. Then how can that milk be traced back to the farmer?—If there is no other body supplying the milk it would be the one; if there are several supplying the milk in the bottles there would be a difficulty.

3002. I mean that gentleman to whom I refer whose name I cannot remember at the moment?—I do remember now, and it can be traced quite easily. They are all sealed with a lead seal, which can be identified.

3003. That is right, but that is not my question. The question is, how he would be able to trace it to the farmer?—He would be responsible if he cannot trace it.

3004. He could not trace it?—No.

3005. Then this idea of yours with regard to the method of testing the producer's cows could not be carried out in the case of one-fourth of the supply of Copenhagen milk?—Yes, it can. It depends altogether where you are going to take the sample. If you are going into a man's house to take a sample there would be no possibility of tracing it back to the farmer; but you could take a sample at a prior time when it can be traced, and I think you would find it very difficult to name circumstances where it could not.

3006. You have said that 25 per cent. of the milk sold in Copenhagen was sold in bottles?—No, I have misunderstood you, if you meant me to say that.

3007. I did not mean you to say that. I only asked you, and you said it was not a large quantity, it was only about one-fourth of the whole supply of Copenhagen?—I said one-fourth of the largest supplier, and it is the company that you referred to that I meant; one-fourth of their milk distribution is in bottles.

3008. I will take it with that correction then; that could not be traced to the farmer, and you recognise that for that proportion the retailer would have to accept the responsibility; I mean this system that you speak of of Committees existing in the country somewhere in order to compare the milk sold with the production of milk given by the cow at a particular farm could not be carried out in the case of those bottles?—It could not be carried out in the first instance with those bottles.

3009. In no other instance could it?—Yes.

3010. What would be the second instance where it could be carried out?—The second instance was if you found the bottles deficient you would then have to sample the milk of all the farmers whose milk was used for filling the bottles when it came in.

3011. It would be no use our doing that in London; if an inspector got a sample of milk it would be no use our getting a sample in two or three days' time, and telling the inspector that that was the same milk, and that that was the farmer?—If you take the risk of sending it out without taking any precautions yourself——

3012. You must not say that; we do not. But I will leave it there. I see in your *précis* you say: "I do not consider that the experience of what the City Analysts found to be the composition of milk is any criterion of what the basis of genuine milk should be; such only proves that the community are supplied with milk of that class." That is your opinion; we have not heard it in evidence before; no one has asked you that?—That is my opinion.

3013. We have had a good many averages of that kind brought before this Committee. On page 5 of one of your pamphlets I am struck with the accuracy of this remark that you have made, namely, "Few people can realise how quickly the larger-sized globules of fat rise to the surface, and if any delay occurs—even to the extent of a few seconds—in drawing the sample after mixing, the results are sure to be unreliable. In drawing samples there is little chance of the percentage of fat in the samples being less than that of the bulk, but there is always some risk of the sample being richer than the bulk"—that is so?—Yes, the reason of that is——

3014. I do not want any reasons if you will allow me to say so; I have no objection to your putting in your reasons if you wish it, but that is not part of my question?—I am entitled to give the reason.

3015. Yes, certainly?—In emptying one vessel into another, at all events the probability is that the globule will come nearer the top, and the sampler, if he is careless, will draw it from the top, consequently he is likely to draw it with a larger proportion of the fat globules.

3016. Then I take it that if milk had been standing, say, for half-an-hour at a railway station, or standing for half-an-hour in cooling, and had been driven into a city, the top portion of the churn would be richer in butter fat than the lowe rportion?—It is to some extent, but after the milk has been cooled the cream comes very slowly to the top; the fat globules do not come to the top to anything like the extent they previously did prior to without cooling.

3017. Not with the same rapidity, that is quite true?—It is a very slow process then.

3018. Of course from what you say about what happens when it is cooled we must infer that when it is not cooled the globules do rise very rapidly?—They do rise very rapidly.

3019. But supposing the milk had not been cooled, and it was driven down three or four miles into a small town, into Reading, for instance, and an inspector took a sample before it was delivered, we may assume that those samples would contain a much larger percentage of butter fat than the average sample in the churn?—It would depend altogether how he took them; if he took them off the top of the churn they certainly would.

3020. He would take them off the bottom of the churn, would he not?—He might, and there might be some emptied out of the churn before he came to take it.

3021. (*Chairman.*) There is one question I want to ask you; we have had very little about cream generally up to now; generally everybody who has said anything about cream has said cream will take care of itself; it grades itself, and according to its quality so people buy it; but you seem to think that there ought to be a standard?—I am inclined to believe that there is as much necessity for a standard for cream as there is for a standard for milk. The public just now ask for a penny worth or twopenny worth, and they have just to take what is really given to them; they have no control over what they get at all other than the not very large body who can make a special bargain.

3022. Do you think the public suffer in consequence, and that they do not get what ought to be cream when they ask for cream?—I have heard the remark made probably a thousand times that we are quite prepared to pay for good cream if the retailer would only give us it in proportion to the price.

3023. Is it not your experience that the ordinary buyer of cream, the ordinary householder, if he does not get supplied what comes up to his expectation in the matter of cream can defend himself; he does not require to go to an analyst to guide him in the product he wants to buy?—He has nothing to gain by going to an analyst.

3024. I say he does not require to go to an analyst?—Supposing he did he would be no further forward than before he went. He would be told it contained 8 or 10 or 12 per cent. of cream, and what better position would he be in at the end of that?

3025. That is not the procedure he would adopt. He would simply change his dealer?—The next man is equally as bad; they are all in the same position.

3026. I do not quite see that myself?—In practice that really is what it amounts to, at any rate.

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3027. There is only one other question I want to ask you. Have you any experience of condensed milk?—I have no experience of condensed milk.

3028. Can you say at all whether you reasonably believe that it enters largely into competition in Glasgow and other centres?—In Scotland I may say it never enters into competition, or, rather, it may, but it is so small that it is not worth taking into account.

3029. (*Mr. Murphy.*) Can you tell me whether separated milk is much used for the feeding of infants in Glasgow?—I do not think, as separated milk alone, that it is used directly as food for infants, but a very low quality of milk is often supplied for that purpose, or at least it is supplied and used for that purpose, and very often that milk contains a much larger proportion of separated milk than it is justified in doing.

3030. How is it sold—as milk?—It is just sold as milk.

3031. Without any suggestion that it is not whole milk?—There is no question asked, and no information given; but it is a remark by everybody who takes any interest in the question that certainly as far as children are concerned it would be an immense improvement if they could be supplied with milk of a better quality than what has hitherto been the case.

3032. As to the prices charged for it, are they lower, as a rule, than the prices that might be charged for whole milk?—I do not think, unless for isolated cases, that milk is specially sold for that purpose for the feeding of children. Some of the outlying dairies, where they have cows, very often supply milk said to be the produce of one particular cow, which is supposed to be given for the daily food of one certain child; but with that exception there is very little difference.

3033. So that the purchaser is paying the full price for whole milk, and believes he is getting it?—He believes he is getting it; at least, I may say he does not believe he is getting it, because there are very few people who believe they are getting it; they only think that is the best they can get under the circumstances.

3034. (*Chairman.*) Does it not occur to you really and truly that if the milk were graded and were sold guaranteed above a certain specific standard, that might be done, and people could get what they want then?—They would then have an opportunity of getting very much better milk than they get at present, and I think it is quite within the bounds of possibility for this Committee to suggest a standard which would be high enough to ensure a fairly good quality of milk without causing any hardship to producers like myself.

3035. (*Dr. Voelcker.*) You said, in answer to Mr. Barham, that you do not think much of the experience of public analysts as to what the composition of genuine milk is likely to be; but I put it to you, is the quality as determined by the public analyst likely to be lower or is it likely to be higher than the truth?—It is likely to be very much lower.

3036. So that experience gathered from the statistics of public analysts as to what milk should be and as to the standard based upon them is likely to err on the side of lowness rather than of highness?—Very much on the side of lowness.

3037. And a standard based upon the real production of cows from the farmers of the country generally is likely to be higher than lower?—It should be so.

3038. In your experience of feeding on grains, do you ever get milk below 3 per cent. of fat?—I have one instance of that.

3039. One instance out of how many?—A great many, and that was where they were fed entirely upon grains, and the smallest quantity of hay that it was possible to keep them living with.

3040. You were keeping them almost on the lowest food that you could imagine?—Yes.

3041. And even then you had very great difficulty in getting it down to 3 per cent.?—No, it went to 2·6 in this particular case.

3042. One case out of a number?—Yes.

3043. You have given it as your deliberate opinion that the milk as it leaves the farmers, and before it finds its way into public consumption undergoes some tampering. What means do you suggest as to avoiding this: would the fixing of a standard help?—I think so.

3044. If that standard were sufficiently high, I take

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it?—Yes; it would do no good at all if you fix a low standard.

3045. The fixing of a low standard would do no good at all?—It might easily make things worse. The moment you fix the legal standard and make it low enough, then I think that everyone ——

3046. A legal standard, if low, would produce what?—It would come very near to making people say, "I have a legal right to lower to that particular standard."

3047. Do you think it would be advisable to have a standard fixed for cream?—I think so.

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Mr. Primrose McConnell, B.Sc., called; and Examined.

3048. (*Chairman.*) You come here to represent the Central Association of Dairy Farmers, I understand?—Yes.

3049. You have been a dairy farmer, in the business all your life?—Yes.

3050. And have been for 20 years engaged especially in producing and selling milk?—Yes.

3051. And have gone through the processes that are necessary to learn the methods of analysing the same?—Yes.

3052. Your attention has been entirely concentrated on milk, and not on cream?—I do not know anything about cream.

3053. You have also tested the milk and cows exhibited at the Dairy Show?—Yes.

3054. And you put before us some figures to show what the result of those tests have been?—Yes.

3055. In your opinion you say you think a standard is necessary; do you say that not only as an individual dairy farmer but as representing the Central Association?—Yes.

3056. You come forward to say you think there ought to be some standard?—There ought to be.

3057. And you think a standard of 3 per cent. for fats, and 8·5 for other solids not fat, would be a fair and reasonable standard for the whole country?—I think so. I advocate that.

3058. Do you say also that if the milk shows less than 3 per cent. of fat, or 8·5 only of other solids, and it still totals up to 12 then it ought to be reckoned as genuine?—Yes.

3059. Would you say that if it was 2·5 of fat, and the rest was made up of solids other than fat. I do not know whether that is possible?—I would pass that, but I do not think those figures would be possible.

3060. I say I do not know whether it is possible, but if it totals 12 would you pass it?—If it totals 12 I would.

3061. Although it does not quite hit the minimum of one or other of the two constituents, still you would reckon it to be genuine?—Yes.

3062. The conditions to which you say you would like to see this standard subject are, that when a case comes into court the defendant may be allowed to produce evidence in his own favour, and that the actual delinquent only shall be punished?—Yes.

3063. Of course we always hope that only the delinquent would be punished, but when you say the defendant is to be allowed to produce evidence in his own favour that means you think he ought to be given an appeal to the cow from which the milk was originally drawn?—Or any other evidence he can produce. I specially had in my mind cases in East London where some of the magistrates would not hear the contrary side; they simply accept the analyst's statement, and punish a man straight away without listening to his own side—that has been the complaint in the East End.

3064. But that is not under the new Act, I think?—Possibly that may be met now.

3065. (*Major Craigie.*) The section which we are considering here certainly says it is only a presumptive standard until the contrary is proved?—That would meet the point, of course.

3066. (*Chairman.*) From your observation you are prepared to say that the standard you advocate could easily be reached by 99 farmers out of every 100?—Yes.

3067. The 100th case would be a man who was either feeding his cows improperly, or who was keeping an animal that he ought not to keep; in fact, those are the two points in which you think the farmer could easily rectify the times and occasions when he falls below?—Yes. There is one other exceptional case, namely, where there is a very great difference between the times of milking; but that is only one case in a hundred, 8 hours and 16 hours apart, for instance; there is a variation in those instances. But a case of that sort is only one in a hundred, and the individual must take measures to protect himself.

3069. You heard Mr. Speir's evidence about the morning's and evening's milk?—Yes.

3069.* From your knowledge of the trade, do you think it would be difficult to force farmers to milk closer together than they do now?—They milk very fairly now—eleven and thirteen hours is the common thing. It is only exceptional cases where they have intervals of 8 and 16 hours, so far as my knowledge goes.

3070. But still, even when they have to milk at such a long interval as 16 hours, cases would arise in which the milk would fall below the standard you advocate?—Yes.

3071. And it would be unfair really to prosecute a man for producing that kind of milk?—That is an occasion, I suggest, in which he ought to be allowed to produce his evidence, and he ought to be prepared with information, by taking analyses over a series of months or so, so as to produce this evidence if he were hauled up in court.

3072. But then, of course, if you do not take such analyses over such a long period as several months, he could prove his case, could he not, by taking the prosecuting agent, whoever he may be, down to his farm?—That is my idea—that he would take steps according to circumstances to protect himself on that point if his milk ever did fall below 3 per cent.

3073. You think that this introduction of the standard which you advocate would prevent the addition of separated milk?—That is specially what we are trying to prevent in advocating this standard. We think, rightly or wrongly, that there is a very large amount of separated milk used in thinning down good milk, and so long as it passes the standard of 2·5, or 2·75 as it used to be, it could not be detected. But if the standard is put at this point of 3 per cent. it will not unduly hurt the producer, and it will prevent a lot of that. It will not prevent it altogether, but it will prevent a lot of it.

3074. Do you think it will? Are you satisfied that this standard would prevent a great deal of watering down, or at least thinning down by separated milk?—Yes.

3075. And you say that as an analyst, do you?—I am not an analyst by any means.

3076. I understand you have had experience in a laboratory?—Yes.

3077. At any rate you say it as a scientific man?—Yes.

3078. And not as a farmer with an idea?—Yes.

3079. I am afraid we farmers have all sorts of ideas which are not always scientifically correct?—Yes.

3080. (*Major Craigie.*) You are representing the Central Association of Dairy Farmers?—Yes.

3081. Can you give us the number of that association; roughly how many persons belong to it?—It has about 2,500 members altogether.

3082. And from what counties and areas?—I have sent in a statement of the Societies in Association; there are 16 Societies.

3083. Are they in the South of England or in the east?—All over the South of England. I can give you the names if you wish—Bedford, Buckingham, Cheshire, Derbyshire, Eastern Counties, Leicestershire, Lutterworth, Market Bosworth, Norfolk, Suffolk, Nottingham, Shaftesbury, Staffordshire, Sussex, Thame and district, and Western Counties. I have not taken the evidence of all those societies. I have only had a meeting with the delegates representing about half since I got notice, and one or two of those societies I believe are sending witnesses direct. I have had the evidence of the representatives of about half of those societies last week as to their opinions. They all agree with me as to that standard excepting one. I have had a letter since I sent in my report from the Nottingham Society. They advocate only 2·75 of fat, and 8·75 of other solids.

3084. That is the only case in which the opinion differs from that which you have given to the Committee?—So far as I have consulted with the representatives.

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3085. Has the subject been under the discussion of those different societies for some time?—Yes.

3086. There has been a good deal of discussion, I understand?—Yes.

3087. And the net result is that with the exception of Nottingham the eight that you have consulted agree in the evidence that you have put before the Committee?—Yes.

3088. These tables that you attach to your *précis*, I understand you wish to put actually into the evidence?—Yes.

3089. In one of them you give the number of the different breeds; are these entirely animals shown at the Dairy Show?—Yes.

3090. Do you consider the conditions of testing at the Dairy Show to be sufficiently normal as to be a guide to other work?—The average is, anyhow, because if the cows are affected one way they are as likely to be affected another; so that I think the average is very fair.

3091. (*Chairman.*) We do not accept them as general tests of the country. You put in the averages of your own farm, the figures of which possibly do not apply to the Dairy Show?—That is so.

3092. Dairy shows we consider are not quite to be treated as fair representatives of the dairy produce of the country, and we have kept them out of view; but these figures relating to your own 21 samples of mixed milk at Ongar Park refer to your own herd?—That is my own herd.

3093. Was that milk taken in the morning or in the evening?—I think mostly in the evening.

3094. Mostly in the evening?—Yes, those samples have been taken over six years.

3095. And you analyse them in a subsequent table?—Yes, I give the details later.

3096. (*Dr. Voelcker.*) Your experience has been very large with Ayrshire cows?—Yes.

3097. Do you share Mr. Speir's opinion as to their having been rather malinged in the evidence that has been given before this Committee?—I have always understood they had a medium quality milk—not so good as a Jersey but better than a Shorthorn. These figures are borne out by the averages from the dairy show; they came out better.

3098. You would not be inclined, then, to say that there ought to be a lower standard fixed to allow of the introduction of Ayrshire cows?—No, I do not think you need lower the standard for that.

3099. You need not lower the standard for the sake of the Ayrshire cows?—No.

3100. You live in Essex?—Yes.

3101. Are there many Dutch cows in Essex?—I really could not say.

3102. Have you any yourself?—I have got four; those four are included in these tables showing the average over some years.

3103. Are there many people in Essex who have Dutch cows?—I do not think there are many; I only know of one or two with Dutch herds.

3104. Would you advocate the lowering of the standard on account of the Dutch cows?—No, I think not, because they would still produce, so far as I have looked into it, 3 per cent. of fat.

3105. So we need not modify our standard very particularly on account of the Ayrshire cows in the country or the Dutch cows?—No.

3106. Your view is distinctly that if we had a standard of anything below 3 per cent. it would admit of a great deal that ought not to count?—Yes.

3107. You make a suggestion in your *précis*, as an addition to the provisoes about the fat and other solids, that in cases where a milk totals up to 12 per cent. total solids there should be an allowance in case it falls below 3 per cent. of fat or 8½ per cent. of solids not fat?—Yes. I do so on account of the experience with my own cows.

3108. Do your cows show over 12 per cent. in many cases?—Yes, but I have had them several times under the 8·5 for solids not fat, and still considerably over 12 per cent. In two samples that I sent up to get analysed because of that the analyst reported to me 4 per cent. of added water or 6 per cent. of added water. I thought it a hardship, seeing that in one case I had over 4 per cent. of fat and over 12 per cent. of total solids, that my milk should be reckoned watered because it fell under the 8·5. So I put in the proviso that if it still comes up to a total of 12 it ought to pass, even it it is under the 3 or under the 8·5.

3109. In this particular case that you have mentioned the milk showed over 4 per cent. of fat?—Yes.

3110. Is it fair to ask the name of the analyst in question?—Yes, Mr. De Hailes.

3111. (*Chairman.*) Did Mr. De Hailes analyse all these samples?—No, he analysed about half, and Mr. Lloyd, of the British Dairy Farmers' Association, has done about the other half.

3112. (*Dr. Voelcker.*) Is it your experience that if that analysis had been produced by Mr. Lloyd he would have certified that it had been adulterated with water?—Do you mean if Mr. Lloyd had done the analysis?

3113. Yes?—I do not know whether he has the same standard or not. I may say that I sent one of the certificates of analysis to Mr. Lloyd, and he reported to me that on the figures the analyst could not get out of reporting 4 per cent. of water.

3114. (*Mr. Barham.*) And it was genuine milk?—It was, for I sent the sample myself.

3115. (*Dr. Voelcker.*) Was there anything particular about the feeding or the health of the cow at that time?—I do not think so. It was a mixed sample, of course.

3116. (*Mr. Barham.*) A sample of the herd?—Yes.

3117. (*Dr. Voelcker.*) How many cows?—I think there were from sixty to seventy cows, but probably in this sample, as I took it from the refrigerator, there might be the milk of eight or ten cows mixed.

3118. You have no evidence to trace back what cows it came from?—No, I could not.

3119. I may take it that you make this proviso generally, which I may say in my own opinion is a very proper one, that when milk shows as much as 12 per cent. of total solids, actual deficiencies above or below a certain figure should not be taken by themselves as constituting any adulteration?—More especially as I think that would meet the hundredth case to a very great extent.

3120. Does not that apply more particularly to the case of solids not fat than to that of fat?—Do you mean the variation?

3121. I mean to say, if you have a milk giving 12 per cent. of total solids, is it not more likely to be the case that you will get a high percentage of fat and the solids below 8·5, rather than a low percentage of fat with very high solids?—Yes, I think that is right. I find that is so from the morning's and evening's milkings that I have tried in the case of the Dairy Show; but you do not care about those figures.

3122. So that this proviso that you make here is rather in view of the solids not fat falling below 8·5 than in view of the fat falling below 3?—Yes, that is so.

3123. That is what I wish to bring out. Is it not then the case that if you have a genuine milk and the solids come up to 12 per cent. or above it you may rightly expect to have well over 3 per cent. of fat?—You ought to have.

3124. So that, in your opinion, a proviso to the effect that if a milk gave 12 per cent. of total solids or over it should show 3·25 of fat or more would not be at all unjust?—No, if you keep to the 12 it would not be unjust to ask 3·25.

3125. If you keep to the 12 you may reasonably expect 3·25 of fat?—Yes.

3126. I take it, though you have had a good deal of chemical and scientific experience, you cannot go farther into the particulars and say what the relations of the nitrogen and the ash would be?—No, I have not had enough experience of that.

3127. Do you know that it is common for analysts, when dealing with these questions of doubtful milks, to go into these matters?—Yes.

3128. You are not aware of the general conclusions that are formed from the percentage of ash in the milk?—No, I do not know anything about that.

3129. Then I must not deal with that. You mentioned the views of your association, and you said that there was one dissentient; could you give any reason for Nottingham being different from the other places?—No, I have no idea why; there is no reason why they should not have the same standard as other places.

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3130. You do not think it at all an unreasonable thing to expect a farmer the milk from whose farm is of rather a poor quality in consequence of his using brewers' grains to excess, to give up the use of them?—If he gave up the use of those he would certainly improve his milk, I think.

3131. And similarly it is not an unreasonable thing to ask that if he has got cows that are not good milk producers, they should be eliminated?—Yes.

3132. Have you yourself had any trouble with regard to prosecutions?—No, I have never been prosecuted. Some of my analyses that have been put in there are just on the borders almost—just 3 per cent. only, but I have never had any trouble in that way. I do not use either grains or mangolds, which is perhaps one reason why I manage to keep up the quality.

3133. Then with regard to the question of mixing milk, do you take any particular steps to ensure that the milk sent out from your herd is the mixed milk of the herd, or does a single churn hold only the produce of four cows?—I do not think there is ever so few as four cows in a single churn; there is always more. We never have four cows all giving their full milk at one time, so that probably in one churn you have eight to ten cows.

3134. Ten is nearer the mark than four?—Yes, possibly even twenty if they were getting nearly dry. We put perhaps the milk of sixty cows into four churns—that is an average of fifteen cows to the churn at a milking.

3135. (*Mr. Barham.*) Then your churns are twice the size of Mr. Speir's?—Yes, they are 17 gallon churns or eight barn gallons.

3136. His were eight gallons, he said, and your own are 17 gallons?—Yes.

3137. (*Dr. Voelcker.*) One question more only. You agree with Mr. Speir, I think, that according to the difference of period between the times of milking so you get a different quality of milk?—Yes.

3138. You say the general custom is to have eleven to thirteen hours?—Yes.

3139. Do you know in some cases cows are milked three times a day?—Very seldom, I think.

3140. I will give you a concrete case—Aberdeen?—I do not know a case myself where they milk the cows three times a day.

3141. Aberdeen is supplied with milk from cows that are milked three times a day, and I could give you many other places. I do not know whether it is done in the neighbourhood of Glasgow, but certainly the milk supply of Aberdeen is sent out from the milkings three times a day?—I did not know that.

3142. If in consequence of three times milking during the day milk of a lower quality than the public would have a right to expect is sent out at any one of those milkings, do you think that the public should be the sufferers from it?—No, I think that the producer will know, or, at any rate, he ought to take steps to learn what his milk usually is and provide accordingly.

3143. (*Mr. Cowan.*) In speaking about separated milk, can you give any recommendation how it should be sold to prevent it being mixed with or sold as full milk?—No, I have not any special recommendation; if it is sold as separated milk, of course that would meet the case.

3144. I thought it was you that spoke of it as being sold in cans marked "Machine separated milk"?—I have no experience of that.

3145. What is your experience in connection with the addition of separated milk to full milk; how much can be added without the liability of detection?—I have had no experience myself of that matter, but a gentleman who is known to some of you made a test in London, and he found that he could add 20 per cent. of separated milk before the chemist detected it.

3146. That is a very large quantity?—He has been examined here; he is Mr. Pocock. I have no experience myself in the matter. We have an idea in the country, rightly or wrongly, that there is a lot of mixing with separated milk.

3147. (*Chairman.*) You say yourself you think that if the standard you bring forward were adopted, that practice would be very much knocked on the head?—Yes.

3148. Is it really the case from an analyst's point of view that if you had 3 per cent. of fat and 8·50 of solids not fat, giving a total of 11·50, that would really obviate a great deal of separated milk being added?—Yes. I am taking it for granted—of course, I have been so informed—that lately the standard of Somerset House has been raised to 3 per cent. of fat, so there would be no alteration there; but under the old standard, which was 2·75, it could be done.

3149. (*Mr. Cowan.*) We have had some evidence which I think has been rather derogatory to the Ayrshire cow, and I would like to ask you, as you have had a good deal of experience as to Ayrshire cows in the better land that you have in England to what we have, if it is not your opinion that the Ayrshire cow gives a superior quality of milk to the Shorthorns?—Yes, that is my experience. I have not tested my own Ayrshires as against my own Shorthorns, but in the dairy trials we have always had a better Ayrshire milk than Shorthorn milk.

3150. May I ask you how it would be in regard to quantity?—There is very little difference in regard to quantity, but it is slightly in favour of the Shorthorns—5 per cent. in favour of the Shorthorns.

3151. (*Chairman.*) Where is that percentage taken from?—From the British Dairy Farmers' trials.

3152. We said we would put them on one side?—I have no evidence outside of those.

3153. (*Mr. Cowan.*) What is your opinion with regard to having a standard for cream?—I do not know anything about cream; I have had no experience of cream.

3154. Have you any opinion about condensed milk?—No, I have had nothing to do with that.

3155. I would like to ask you a question put to Mr. Speir, namely, where the responsibility of the producer is to cease?—I think his responsibility ought to cease when the milk is out of his own hands or his man's hands; in the case of a producer sending by rail it ought to cease at the station.

3156. (*Mr. Barham.*) Which station?—His own station—his home station.

3157. (*Mr. Cowan.*) Then in speaking about the hundredth man, do you not think you would get quit of him if that man would turn his attention to other kinds of stock to put on the land that he has; there will be so much land very poor that is used as dairy land at the present time?—Yes. I think there is a lot of dairying done on land that is really not suitable for it and which naturally produces a low quality of milk. Consequently, if the public are to be protected, they ought to have no mercy shown to them, I think.

3158. (*Chairman.*) You heard what Mr. Speir said upon that, that he did not think the quality of the grass affected the quality of the milk—it was only the quantity. You say that bad grass will produce a low quality of milk, which is quite the reverse?—Bad land, I mean.

3159. I call that bad grass—bad pasture?—They are not exactly the same.

3160. We both mean the same thing, do we not? Do you think bad land will grow good grass, because I do not?—Yes, if it has been manured.

3161. Then you are making bad land into good land?—I am thinking of a case which I know of land on the millstone grit, which is the poorest soil in the country, I think, and they can scarcely get the milk up to 3 per cent. In that particular case I think they ought not to have cows at all. That is the hundredth case, at any rate, that wants special treatment.

3162. (*Mr. Barham.*) What district is that?—I think a gentleman gave evidence from it—Mr. Marshall, of Tyneside.

3163. (*Dr. Voelcker.*) There is plenty of smoke about there, is there not?—Yes, I think so.

3164. (*Mr. Barham.*) Were those twenty-one samples that you gave us in one of the tables taken by yourself?—Not all.

3165. They were not all taken by yourself?—No. I ought to explain that some of them were taken at the London end by my milkman, who is instructed by me to sample them from time to time and get them analysed at my expense and let me have the results, so that probably half were taken at the Stratford end where I send my milk, and half at home.

3166. You have heard what Mr. Speir said, namely, that it is possible to get too much cream in a sample, but that it is impossible to get too little; do you not think one of these having been taken from the churns when they were ready to go away or when they arrive at Stratford would contain rather more than the normal percentage

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of butter fat or the percentage contained in the whole of the churn?—Those samples I took myself of course I know were average samples without too much cream or too little; and my milkman at the other end has instructions to take samples after mixing.

3167. But you were not present to see whether it was done or not?—No I was not.

3168. There are two or three ways of mixing, one is to mix it with a measure and stir it up and down, and the other is to shoot it right out and back again?—That is what I meant him to do, of course.

3169. Then you say you do not give your cows either grains or mangolds?—No.

3170. And if you did, in all probability you would be below the mark or you would not have quite such good results?—I should be nearly 3 per cent., if not under it, I think.

3171. Then, of course, I presume you would not attempt to legislate for the whole of the farmers in the kingdom and say that they should not use mangolds or should not use grains for their cows?—Those men would have to do what they please if they are asked to produce milk with 3 per cent. of fat. If they use too many grains they are running a certain risk, and they must take precautions accordingly.

3172. Exactly; one of the reasons for your good results is the fact that you have not used either grains or mangolds?—Yes.

3173. And yet, as you pointed out just now, 20 per cent. of your samples are dangerously near the border line?—Twenty per cent.

3174. 3·10, 3·00, 3·00, 3·10; that is four out of twenty-one, which is practically 20 per cent.?—Yes.

3175. Twenty per cent.—just on the danger line?—Yes.

3176. You know sufficiently from what you have told us of chemical analysis to know that analysts do not always give exactly the same result with the same sample of milk. We have had it in evidence here that Scotch analysts—analysts of three important towns in Scotland—have varied in their returns of butter-fat in exactly the same sample of milk from 2 to 2·7. Now, I do not mean to say that that would represent anything like the average difference between analysts, but I take it there is a variation, and there must be a variation between them?—Yes.

3177. Supposing your milk contained exactly 3 per cent. of butter-fat, and there was a variation in the analysis from the fact of the analyst not being able to find quite all of it, you would then, of course, be below the limit?—Yes.

3178. With twenty per cent. of your samples?—Yes.

3179. (*Dr. Voelcker.*) Would you mind giving me these figures where the analyst called the milk in question with the 4 per cent. of fat?—It is No. 2 on my list, and the figures are 4·1 of fat, 8·29 other solids, showing a total of 12·39. It is the second case in January. I might be allowed to explain regarding some of these samples of mine that the low percentages are in the spring, when there is a flush of grass, and in the autumn, when we have an excessive heat. There is no grain used generally at those times.

3180. (*Chairman.*) You have left out the last four months of the year?—I never had any fear of coming low in those months, so I have never had any analysis taken in those months. I am only afraid of the period about April and the end of June or July in a hot season.

Mr. R. Finney, called; and Examined.

Mr. R. Finney.

3181. (*Chairman.*) You come here to represent the Derbyshire Dairy Farmers' Association?—Yes.

3182. And you are yourself a farmer in Leicestershire?—Yes, on the borders of Derbyshire. Derby happens to be my market town, although I reside in Leicestershire.

3183. You have been selling milk in London for a great many years I believe?—Yes, for a long time.

3184. You come to tell us that your dairy farmers in Derbyshire think it would be risky to fix a legal standard?—Yes.

3185. Because some cows give lower results than others?—Yes.

3186. If you put a high standard up a genuine milk might be condemned, and if you put it low a good milk would be watered down?—Yes.

3187. Is that generally the impression among your dairy farmers?—That is the impression in Derbyshire. I think it is possible it may have been arrived at in this way: Derbyshire is a milk-producing county; perhaps nobody knows that better than Mr. Barham; and it is subject to drought, and is close to Burton-on-Trent, where you know grains are produced. It is a very common practice with a good many farmers in Derbyshire when we have a drought and the grass dries up very much, to use a great quantity of grains to keep their cattle alive at all. Unless that is used with a mixture of something else you get rather a low quality of milk. A good many mangolds are used in Derbyshire also, and there is no doubt milk varies very much indeed in different localities, partly through locality and partly through feeding. The Derbyshire Dairy Farmers' Association is connected with the Central Association of Dairy Farmers. I have heard the evidence of Mr. McConnell; we do not quite agree with that, although we are connected with the same association.

3188. Your friends have arrived at their conclusions in consequence of having had a number of analyses presented to them of their milk?—Partly in that way; of course, I am not an analyst, and I am not going to say anything about analysis, as I know nothing about it.

3189. You must have had some tables or something to make you come to that decision?—They felt, as I explained, through varying circumstances, that there would be a great risk in fixing a standard, but they are very anxious if you do fix a standard that you will be very careful what that standard shall be. Of course, I am not going to suggest any standard to you.

3190. You come to say you do not think there ought to be a standard at all?—That is the opinion of the Derbyshire farmers.

3191. There is a standard, so to speak, now?—There is a sort of standard, a recognised standard, which is called the Somerset House standard, but is that a legal standard?

3192. It is a standard, I understand, on which magistrates convict nowadays?—We may take that as the legal standard, then?

3193. It is so that as far as there is a legal standard at all there is one already; therefore, I was going to say you would apparently wish to do away with the present *quasi* standard; what would you do then—how would you propose to proceed?—What we want you to do is to make such arrangements if you can that if a farmer sends a pure milk, and if he can prove that it is pure milk by a visit to see the cows milked themselves, that it shall pass as pure milk, and that he shall not be liable to a prosecution. I am not going to explain how it should be done; of course, you know the way better than I do.

3194. If you have got him at all in the position of having his milk impugned, he must have that milk subjected to some test?—No doubt he would have it subjected to the test you have mentioned—the Somerset House standard—but I think he ought to have the opportunity of proving that it is pure.

3195. That I quite think too; but at the same time you do not help us at all; that there should be a standard you must admit?—My association is composed of farmers principally, and we did not quite feel that we were capable of giving that advice that you ought to receive, because we are only farmers.

3196. You come to say there ought not to be a standard at all; so, therefore, it puts us rather in a fix; and then, of course, you cannot help admitting that there must be some sort of standard?—Yes, I admit that. You want some sort of recognised standard.

3197. It is a question for us to ascertain if we can from enquiries of all in the trade what sort of standard would satisfy them, and how they can advise us to put one up?—I do not think we can advise on that; but we do not want you to put it too high, you know.

3198. Have any of your friends been prosecuted for having milk below the standard?—Yes.

3199. Have you any figures in relation to those prosecutions?—Our association looks after all those cases for our

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members. It is a very common thing for a man to be summoned for adulteration, but it is frequently proved that the milk has been tampered with in some way. It is very seldom that any of our members are really placed in that position that we feel that they have tampered with their milk—very seldom.

3200. They have generally been able to clear themselves?—They are generally able to prove that some milk has been spilt out and some water put in, and that it has been tampered with on the way. We feel very strongly on that point, and I was asked to press that upon your notice as much as I possibly could, so that you should make such arrangements that a farmer shall not be liable for the milk after it leaves his hands, or, in other words, after it leaves either his farm or when he has delivered it at the railway station.

3201. That, I suppose, is the subject of a private arrangement between him and the man he sends his milk to now?—As a rule the farmers are held responsible until such time, if it is sent to London, as it arrives here, you know—which we think very hard.

3202. That is a question of private arrangement between the farmer and the milk seller, is it not?—No, it is not altogether a question of private arrangement, because the milk seller is satisfied with the milk. It is the authorities that pounce upon the seller and get a sample of his milk, and if it is found to be in a certain condition, then he falls back on the farmer.

3203. The contract that is entered into is made between the farmer and the man who buys in the town?—Yes.

3204. And the man who buys in the town says, "I will not take your milk until you deliver it at my station"?—Yes.

3205. It is open equally to the farmer to say, "I will not sell you my milk unless you take delivery at my station"?—The consequence would be that he would not be able to sell his milk at all.

3206. The other man would not be able to buy it?—With us it would soon come to an end.

3207. It is a question of contract, is it not?—We still think that the farmer ought not to be held responsible after it leaves his hands, because he is not responsible for what takes place with the milk while it is in transit. I hope you will make a note of that.

3208. Yes, we have already done so; we have heard this point of the sealing of cans raised by a great many witnesses. I do not know whether we shall be able to do anything with it?—Thank you.

3209. (*Major Craigie.*) You speak of a strong feeling among the members of the Derbyshire Farmers' Association?—Yes.

3210. How has that feeling been shown; have they ever had a formal meeting?—We have had a meeting of the Council, which is a very representative one; it is a very large Council.

3211. How many would attend a Council meeting of that kind?—Perhaps forty, from all parts of the county

3212. From a number of districts in the county of Derby?—Yes, from all over the county.

3213. Did that meeting of the Council pass a formal resolution of any sort?—They did.

3214. Have you a copy of that, and could you put it in?—No, I cannot. The secretary did not give me a copy of the resolution. I asked the question myself whether they were in favour of a fixed standard for milk, because I wanted to represent them as well as myself; and they were in favour of not fixing a standard.

3215. There are no actual words in which they said so?—No, I do not think so—not as a formal resolution.

3216. (*Chairman.*) But the sense of the meeting was so?—Yes, the sense of the meeting was so.

3217. (*Major Craigie.*) We must take it that your impression of the sense of the meeting was that no standard could be fixed?—Yes.

3218. Do you mean by that that the fixing of a standard of any kind, even a very low standard, would be objectionable, or do you mean that the fixing of a low standard would be objectionable in itself for other reasons?—The reasons were that if the standard was fixed low it would be open to milk being tampered with, and if it was fixed high the farmers would be liable to prosecution when they were perfectly innocent. That was the meaning of the resolution.

3219. Could you tell me whether at the time that that discussion was going on the terms of the reference to this Committee were before them, or the terms of section 4 of the Act?—The reference to this Committee was before them.

3220. Therefore, it was clear to the Derbyshire farmers that the proposed standard, which the Committee was asked to enquire into the desirability or not of establishing, was to be a standard that would raise a presumption only until the contrary was proved—it was only a presumptive standard?—That is it.

3221. And yet, with that before them, they still came to the conclusion that there should not be even a presumption?—Yes, that was the resolution.

3222. Then that other question, the question of delivery, I did not quite catch from your evidence whether you had found a difficulty with the railway companies in the locking of the churns; I think you said the farmer must retain the control of the milk until the sample was taken?—No, I did not say that. I said that the former ought not to be held responsible for the quality of the milk after it left his control.

3223. His control would last till when?—Until it gets into the railway station.

3224. The railway station at which——?—He delivers.

3225. At the end of the journey?—No, when he puts it out of his cart into the railway train he ceases to have control over it.

3226. Would that point not be met—I put it in this way—by the sealing or locking of the churn?—It might be. Some of our members said a good deal about sealing and locking churns, but it seems not to be done at all. I do not know whether any milk comes to London in that way, but I have not seen any sealed or locked churns myself.

3227. (*Mr. Barham.*) There is some comes in that way, but very little?—It must be very little.

3228. (*Major Craigie.*) As a matter of fact, in your experience it is not usual?—No, it is not usual.

3229. But the railway companies have been approached on that subject, and they have not declined?—I did not know that.

3230. As a matter of fact, we have had a communication from the railway companies upon the subject?—I did not know.

3231. (*Dr. Voelcker.*) I supose that your farmers have only a very general idea of what is the quality of their milk as expressed in analytical figures?—That is so.

3232. And your remarks as to what the standard should be are quite of a general character?—Yes, quite.

3233. The desire that actuated all, when you said that you did not wish to have any standard, was, we will say, a natural desire to be on the safe side?—Yes.

3234. You fear that some trouble might possibly be caused, and you do not want to be in for it; but you agree now, from what you have heard, that something in the nature of a standard is necessary?—It appears that there is such a thing, namely, the Somerset House standard.

3235. There has been a standard?—Yes.

3236. Or a standard has been believed to exist; that standard, from your experience, has not been one pressing unduly on the milk producer?—No, I do not think so.

3237. One might almost go to the extent of saying that it has rather given an inducement to bring milk down to that standard than up to it, has it not?—I do not know.

3238. You say in your *précis* that if the standard is fixed low it would lead to mixing separated milk; where would that take place—on the farms?—There is a very common feeling of that kind.

3239. Would it take place on the farms?—On the farms they would not have any separated milk; they do not make separated milk on the farms.

3240. Your farmers do not have separated milk to deal with?—No, farmers do not make separated milk.

3241. Who is going to do it then?—I do not know. I dare say you open your eyes generally as well as I do.

3242. Are you in the habit of sending your milk to big dairy companies in London?—Yes.

3243. Do they make any proviso with you as to the quality of that milk?—No, none whatever.

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3244. Not that it shall be the milk as it comes from the cow?—Yes, as it comes from the cow.

3245. Do you ever get an intimation from them that it is not quite all it ought to be?—No.

3246. Derbyshire is good, then?—I do not get any intimation of that kind.

3247. I am speaking of the general body of your members?—I have not heard of any of them having received an intimation; they may have done, but they have not mentioned it to me certainly.

3248. (*Chairman.*) I asked you if you had had prosecutions, and I understood you said several?—There have been prosecutions, but it was an intimation this gentleman said.

3249. (*Dr. Voelcker.*) They are afraid of a standard being fixed because some of the farmers could not produce milk up to that quality, but they have no very clear idea that they would not?—I do not think they quite knew what the standard would be.

3250. As I say, they wished to be on the safe side?—Yes.

3251. You say with regard to the taking of samples, that if samples are taken they should be taken at the railway station where the farmers deliver the milk?—Yes.

3252. That is based on the same wish for security in all your association?—There is a very strong feeling of that kind I can assure you.

3253. The feeling that actuated the members of your association was that they should be on the safe side there, too?—The feeling actuating our members was because they lost control of the milk as soon as it was placed in the hands of the railway company.

3254. And they might be made responsible afterwards?—They have been made responsible, you see.

3255. Do I understand, then, that as long as they secured themselves by having samples taken when they delivered the milk at the railway station, they do not care much what happens to it afterwards?—Because they felt it was not their business at all.

3256. In other words they did not trouble what happened to it afterwards?—I do not think they trouble a bit.

3257. So that when you say the fixing of a low standard would lead to the mixing of separated milk, it really was not a point of such very great importance to the farmers themselves what happened to the milk afterwards?—What?

3258. I mean this is not put forward with a view of benefiting the public generally?—I think they consider themselves as farmers. I think they put it from their own point of view.

3259. You quite admit that there is another side of the question, and that is, the public has to be safeguarded too?—No doubt about that, but this is the farmer's point of view.

3260. I am saying that we are not to regard this entirely from the farmers' point of view?—That is their view anyhow.

3261. (*Mr. Cowan.*) Have you large herds of dairy cows in your county?—Fairly large, running up to fifties and sixties, and that sort of thing, and many small farmers as well.

3262. Is the produce of those cows made mostly into butter and cheese in Derbyshire?—No, it is principally sold as milk; cheese making is very much on the decrease.

3263. You have had experience of dairy cows yourself?—Yes.

3264. From your own experience do you think there is the slightest bit of difficulty in getting the 3 per cent. of fat out of a mixed herd?—I do not know; I am not an analyst.

3265. But you must have had your milk analysed?—I have had no complaints of it.

3266. Then you may depend upon it it has been all right?—That is all I can say of it.

3267. You speak of its being risky to fix a standard, as the milk of some cows is lower than that of others?—Yes.

3268. In your opinion are there any herds kept on some kinds of land that would be better applied to other stock? Would it be with respect to herds of cows that were being pastured on land that is really not sufficiently good for keeping a herd on?—I do not think there is much land of that kind in Derbyshire. Derbyshire is proverbially a dairy county, and I should think there is very little land in Derbyshire but what would be suitable for dairy cows unless it was some of the rougher barren moorland or the high limestone land in the north of the country. I do not know how that would be at all; possibly cows are not kept there; you know what I mean.

3269. Yes. Do you think there are many cows that really produce less than 3 per cent. of butter-fat?—Some individual cows would.

3270. You would not like to prevent a standard being fixed simply because there were one or two cows in each herd that might be got quit of?—No. I do not think so.

3271. It appears to me from what you state that you would be in favour of a 3 per cent. standard of butter-fat—yourself personally?—No; I am not an analyst. As I told you before, I cannot fix any standard at all.

3272. (*Chairman.*) You dread the unknown?—I always feel that we have no control as to what the cow gives, or so little control. You have a little control in feeding and heat, and that kind of thing.

3273. (*Mr. Cowan.*) And also in the kind of cow you keep, surely?—Yes, you have a little control there. We keep a sort of Shorthorn mostly.

3274. I was going to ask you what are they—mostly Shorthorns or Shorthorn crosses?—Shorthorn crosses.

3275. Have you any Dutch cows there?—Very few.

3276. Any Ayrshires?—Very few.

3277. Mostly Shorthorns?—Yes, what are known as Derbyshire Shorthorns—a sort of cross stock; you get some of them exhibited at the London shows here.

3278. You speak of being a butter farmer and a member of the Leicestershire County Council; does your evidence refer to both the counties of Derbyshire and Leicestershire?—I am a farmer and I happen to represent the Derbyshire Dairy Farmers' Association, because Derby is my market town; but I reside in Leicestershire, and I am a member of the Leicestershire County Council.

3279. And you are a representative of both those counties?—And also on the Food and Drugs Committee; these things come before me in another place.

3280. (*Mr. Barham.*) You say you are not advocating a standard of any kind; you have heard Professor McConnell's evidence this morning?—Yes.

3281. You know he was here representing the Central Dairy Farmers' Association?—Yes.

3282. Of which the Derbyshire Dairy Farmers' Association are members?—Yes.

3283. His views do not represent the views of the Leicestershire, the Derbyshire, or the Staffordshire Associations, is that so?—I cannot speak for Leicestershire and Staffordshire; my views are the views of the Derbyshire Association.

3284. The production of milk in these three counties is very similar, is it not?—Yes, it will run about the same quality.

3285. You heard Professor McConnell say that 20 per cent. of the milk that he had analysed from his own herd was dangerously near the border line?—I did.

3286. But that he was able to keep above the border line because he did not use either grains or mangolds?—I did.

3287. Grains and mangolds are used largely in Staffordshire, Derbyshire, and Leicestershire, are they not?—Yes, they are in Derbyshire and in Staffordshire, and in part of Leicestershire, too.

3288. I presume that having heard Professor McConnell's evidence to-day, and believing it as coming from a practical farmer, you would not consider it safe to fix 3 per cent. of butter-fat as the lowest limit?—I was surprised at his figures; I must admit that.

3289. You would not consider it safe to fix that limit?—I should not.

3290. Seeing that your county use mangolds and grains, and so on?—I should not unless we have better grass than he has.

3891. You have not that all the year round, have you?—We have hay, you see.

3292. Now, you talk about your responsibility ceasing at the country station?—Yes.

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3293. I take it that you think there is a danger between the country station and the London station of its being tampered with on the way?—Yes, that is so.

3294. You would desire that if anyone was fined £100 or had three months' hard labour that it should be the dealer and not the farmer?—I did not suggest anything of the kind.

3295. But you understand it, do you not?—I would rather you were fined than myself, you know.

3296. It would be a much more serious thing for me than it would be for you?—Oh, dear no.

3297. You see I have the reputation of nearly 400 farmers to sustain; you have only your own reputation?—Yes, that is true.

3298. That is why you desire the liability to cease at the country station; it is because you think that there is a risk of the milk being tampered with between the country and the town station?—Yes, we have had it proved that it has been tampered with.

3299. Under the present law and under this Act of Parliament you understand, I presume, that somebody is responsible for it when it is sold to the public, so that if it is tampered with at all before it reaches the public, then either the retailer, who is as innocent as yourself——?—Yes.

3300. Or the farmer must be responsible; I mean if the public is to be protected, one or the other is to be responsible, and you prefer that the retailer should?—I do not want the farmer to be responsible when he has no control over the milk.

3301. You would rather the retailer was responsible for it?—I do not want the farmer to be responsible for it.

3302. (*Dr. Voelcker.*) Why are not the churns sealed; what is your objection to sealing?—It is not practised at all; I never see any sealed.

3303. (*Mr. Barham.*) They can be sealed, and easily, if that is a serious consideration?—I have never seen it done.

3304. (*Dr. Voelcker.*) Do the railway companies object to taking it if sealed?—I do not think so. Do they say so?

3305. (*Mr. Cowan.*) In many instances?—I did not know that.

3306. (*Chairman.*) We hear now that they have withdrawn their objections?—I did not know anything about that.

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Mr. WILLIAM BOWLER, called; and Examined.

3307. (*Chairman.*) You come up, I understand, from Longsight, Manchester?—Yes.

3308. You represent the Manchester and Salford Milk Dealers' Association?—Yes.

3309. Can you tell us what sort of body you represent, and what number of members you have got?—We have about 400 members.

3310. Can you give us figures as to the amount of milk they deal with in the year?—I have not got those figures.

3311. Can you give us an idea of the extent of the trade—I will not press it if you have not got the facts before you?—It is for three-quarters of a million of inhabitants anyway, so it is a very large amount.

3312. Is every single milk dealer in Manchester and Salford a member of this association?—Not every single one, but the majority are members.

3313. Did they hold a meeting to consider this particular question?—Yes, they did.

3314. And they have asked you to come here to say, to begin with, that they think a standard should be fixed?—Yes, they think so, decidedly.

3315. And they think that standard should be 2·75 of fat and 8·75 of non-fatty solids?—Yes, that is it.

3316. You wish to give us your reasons for arriving at those figures?—Yes, it is from twenty-five years of my own experience, and twenty years of our association's experience. I may say that this has been submitted to the committee, and they all agree with the following——

3317. (*Mr. Barham.*) Do you mean that it has been submitted to the committee of the association?—Yes. We think it desirable in Manchester to have one uniform standard for milk, and that this should be fixed at 11·50 total solids for pure milk, of which 2·75 should be fat and 8·75 non-fatty solids. The system adopted in Manchester is one of comparison—that is, by the authorities of the Corporation. Suppose a small shopkeeper is served with morning's milk, and the inspector takes a sample of it. In a few days he waits for the dealer who served it, who may this time serve night's milk, and sometimes there may be so much difference between night's and morning's milk that the shopkeeper would get the blame of having adulterated it; and it is quite possible that the second milk might be from a different farm—a better and richer milk altogether. But when the morning's milk is over the above standerd these wide differences will not affect the shopkeeper. We think the question of standard is a very serious one, which no analyst should be allowed to decide for himself. Without a milk standard the public analyst has no guide. There is another question which, we think, of equal importance, and that is the method of milk analysis. Some analysts adopt one system and some another: hence differences, but men's reputations depend upon the results. The method of procedure which has been found to work so well in Manchester is for the inspector to follow up any sample of milk which falls below 2·75 fat or 8·75 solids not fat to its source. Should the shopkeeper's sample be wrong, then the inspector meets the dairyman on his delivery, and, if this is also wrong, the inspector is required to meet the farmer's milk at the station or place of delivery, and, should this also fall below the above limit, the farmer must either allow a sample to be taken at the farm, after the inspector has seen the cows milked, or he is responsible to the authorities for the condition of the milk. Should the milk obtained direct from the cows be similar in quality to previous samples, then the farmer is cleared, and the case ends; but if the milk from the cows if of good quality, then, whatever the results of the analysis, this is made the standard by which the preceding samples are judged as to the extent of adulteration; but this is not always fair, as I will refer to after. In order to prove the good effect this procedure has had on the Manchester milk supply, I will here give the number of samples of milk analysed for our members by the society analyst since 1881, with the results:—

YEAR.	Samples Analysed.	Found Adulterated.
1881 - - -	137	89
1882 - - -	155	71
1883 - - -	164	98
1884 - - -	382	162
1885 - - -	380	150
1886 - - -	614	188
1887 - - -	618	222
1888 - - -	818	230
1889 - - -	704	204
1890 - - -	722	252
1891 - - -	580	165

The remarks by the society's analyst were that: "It it is very satisfactory to find that the percentage of adulterated samples is decreasing, as they number 165, or nearly 28½ per cent., compared with 35 per cent., which has been the percentage now for some years."

3318. Are these samples obtained from the farmers' milk as delivered to the stations?—Yes.

3319. From the farmers?—From the farmers.

3320. (*Chairman.*) Do I understand that they are considered as adulterated as the result of analyses by your society's analyst?—Yes, they come below the standard of 2·75 of fat and 8·75 of solids not fat.

3321. Coming below that, they are called adulterated?—Yes, that is the point.

3322. It does not follow that they really are adulterated?—No, it does not follow so at all, but he calls them that in his report.

3223. (*Dr. Voelcker.*) Who is the analyst?—Mr.

Dancer. In 1892, 804 samples were analysed, and 199 found to be adulterated; in 1893, 712 samples analysed, 165 adulterated; 1894, 794 samples, 175 adulterated, or 22½ per cent. below limit (11·50); 1895, 723 samples, 131 adulterated—18 per cent.; 1897, 912 samples, 114 adulterated—12½ per cent.; 1898, 1,269 samples, 140 adulterated—11 per cent.; and 1899, 1,423 samples, 135 adulterated—9½ per cent.; The society's analyst's remarks in 1898 were: "Taking into consideration the fact that the majority of these adulterated samples have been analysed twice, and in some cases three times, the above percentage should be reduced at least one-half; fair proof that the milk supply of the district is in a fairly satisfactory condition." I may explain this by saying that, in the first place, the dealer, when he suspects that his milk is not coming right, has a sample taken and sent to the analyst. Then he writes to his farmer if it is below the standard and that he must improve it. If it is not improved within a week or two he tests it again, and, if he finds it the same, then he goes to the authorities and asks them to come and test a sample. So that is three samples taken of one milk. That is the way it is explained: for one adulterated sample there would be three samples taken. So that, of all these that we call adulterated, or below the limit, there have been two or three samples taken of one milk. Therefore, the figures do not show that the milk of Manchester is coming in like this, because it is suspected, in the first instance, when we are sending them to the analyst they are not satisfactory. The public analyst's reports to Somerset House show that Manchester and Salford have the purest milk supply in the kingdom. In reference to the taking of samples from the farm, which I have just referred to, may I explain here it is not fair to the farmer, when, for instance, there may be a sudden change of temperature between the time when the sample is taken off the shopkeeper or the dairyman, and the time when the inspector visits the farm, which would be about ten days to a fortnight, because he has to take four samples altogether and submit them to the analyst. In spring time the mean temperature may rise during that period 20 degrees; and then it is only fair to the farmer to allow twenty points in fat; and I question if this would be sufficient. Supposing the shopkeeper's sample is 2·55 of fat and the farmer's is 2·75, the farmer should not be liable for circumstances over which he has no control. We think the mean temperature when the first sample was taken should be considered. If the temperature is much higher then, we know that that will affect the cow's milk.

3324. (*Mr. Cowan.*) That difference in temperature would only apply to the cows when they were out at pasture, would it?—The temperature affects the cow-sheds now more than it used to do on account of the farmers not being allowed to stuff all the draught holes up in cold weather, as used to be the practice.

3325. (*Mr. Barham.*) There is more ventilation now in consequence of the desire to escape tuberculosis as much as possible?—That is the point. I am interested in farming as much as in the dealing.

3326. (*Mr. Cowan.*) The difference of temperature from what you say affects the cows both summer and winter?—Decidedly, both summer and winter, and it will affect the quantity of fat in the milk. We have had samples recently analysed which show that now—this month—the morning samples are not coming up to 3 per cent. That is with what we know to be all pure milk, because the morning samples cannot be tampered with at farms so far as the fat is concerned, and we know they are giving the solids not fat quite high, and yet the fat is below the 3 per cent. There are here results of analyses of samples taken out of twenty-seven cans which came on the 7th of March; out of that number there are ten which came below 2·90—ten morning's milks out of twenty-seven cans. The night's milks are all invariably over 3 per cent.

3327. (*Mr. Barham.*) There is no question so far as Manchester is concerned but what these milks were absolutely pure?—Absolutely.

3328. You saw them taken out of the train?—Yes.

3329. There had been no tampering with them by any dairyman or anything of the kind?—No, they were mixed up with a large measuring can and poured back again thoroughly mixed.

3330. (*Mr. Cowan.*) Did all that milk come from the country?—All came from the country that morning; that is on the 7th of March. The night's milks are over the 3 per cent. limit.

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3331. (*Chairman.*) They were all over?—Yes, they were all over the 3 per cent. limit.

3332. What happens in Manchester in the cases of prosecution, do you know?—I suppose there have been cases where people have been convicted for adulterated milk?—Yes.

3333. What is the standard that is recognised there?—2·75 of fat and 8·75 of solids not fat.

3334. In that city?—Yes.

3335. With the magistrates?—Yes. If a sample comes below that they follow it to the cow. What I think is not quite fair to the farmer is that when they go to the farm they take the sample that is taken at the farm as the standard, and not the 2·75, and they judge the first sample by the sample that is taken at the farm.

3336. If it happens to be a very good one do they say at once something must have happened to this milk a fortnight ago before it was sold?—Yes.

3337. (*Mr. Barham.*) He has appealed unto Cæsar, and by Cæsar he must be judged. When the temperature is raised from the time, as I understand at this time of the year it is liable to be, it is not just to the farmer, and an innocent farmer is liable to be convicted?—Yes.

3339. (*Chairman.*) Is it not the case that at this time of the year the milk begins to fall off?—I mean to say that where the temperature has to do with the fat in milk is when there is a very cold east wind at the time the sample might be taken from the shop or from the dairyman; the appeal to the farmer is made a fortnight afterwards; in a fortnight the temperature may be up 20 degrees; then the cow does not require the fat for her system, and in the milk appeal the fat may go up 50 points; and then the farmer is judged off that, and so he is convicted wrongly.

3340. The last witness but one said quite contrary to you that as the weather gets warmer the milk ought to get better?—When they go out to grass, for instance—when the grass is weedy——

3341. (*Dr. Voelcker.*) The first flush?—Just the first flush of the grass—that is the point.

3342. That is a very short time?—Yes, it is only when they go out occasionally. Some are turned out for a few hours in the daytime when there is no grass and have the same normal food that they have had the fortnight before, and the weather is so much warmer, so that the milk will be fifty points up.

3343. (*Chairman.*) Then, again, take it in this way. The last witness but one said he did not take any samples of his milk from September on as the weather got colder, because the weather got better and better; as the weather got colder the milk got better; and the doubtful times with him were the months he did mention—March, April, and May. His figures bore him out that at that time of the year as the days do begin to get warmer even then, his milk got worse. So I do not quite follow you when you say that as the weather got warmer the milk got better?—That is our experience. We find the milk is better from July on to December.

3344. You have taken the case of a man who has subjected his cow to a test fourteen days after the first prosecution was authorised?—Yes.

3345. You said in those fourteen days the temperature would very likely have gone up 20 degrees, therefore the cow requires less fat to nourish herself; therefore her milk is better?—That is so.

3346. (*Dr. Voelcker.*) In reference to the standard that you recommend here, are these the ideas of your association as individuals, or are they the opinions formed under the guidance of your analyst?—From the practical results of our analyses from our own analyst.

3347. Have you any table of analyses giving the results showing that this would be a fair standard?—We have what I have given you.

3348. You have no tabulated results?—No, we have the average results for the year to go by. I may say it is also the opinion of our analyst who analysed 1,423 samples last year, and 1,269 the year before, or over a thousand samples a year. He is with us on that point.

3349. Who is your analyst?—Mr. W. Dancer, B.Sc., Trafford Mount, Old Trafford.

3350. Has he had considerable experience in the

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analysis of milk?—Yes, he has done over a thousand analyses a year.

3351. Do you happen to know by what method these determinations are arrived at?—By the Wanklyn process.

3352. That is rather an antiquated method now, I think, is it not?—He still adopts that process.

3353. And it was on the results as given by that method that these figures of 2·75 for fat and 8·75 for solids not fat were fixed upon?—Yes.

3354. Do you know the name of Dr. Dyer?—Yes, I have heard the name.

3355. We have had it in evidence from Dr. Dyer that anything higher than 8·5 would not be fair?—Our analyses do not bear out that—everyone that we have had taken is over 9—we have had nothing less than 9.

3356. I put it to you that it is quite possible that the difference between your 8·75 and somebody else's 8·5 may be due to the difference in the method of analysis?—Yes, decidedly.

3357. You are not prepared to say whether that is the case or not?—I am not prepared to say so.

3358. As concerning ourselves it is an important point because we might be led to take a figure which we have in evidence from other chemists would be an unfair one. We heard just now from Professor Primrose McConnell that he submitted a sample of milk for analysis, and he had 4 per cent. of fat in it, and only 8·29 of solids not fat, and that was a milk that came straight from the cow, and a good cow?—Yes, that is possible.

3359. That milk according to your analyst would have been condemned as adulterated?—Yes, decidedly, so far as the solids not fat were concerned.

3360. Unless there was a difference in the method of analysis?—Yes, indeed.

3361. Are you prepared to say that your analyst still keeps to this method?—Yes, I saw him a fortnight ago; he still keeps to it.

3362. Do you happen to know whether he maintains that it is the one which gives the best results now?—I think he has always analysed by that, so he is not prepared, I suppose, to judge of others.

3363. Has he not had experience of the others?—I do not know; he will not have had experience with the others at all.

3364. You see the difficulty that it puts before us is that you are advocating a standard which is based upon the working of a particular method?—Yes. But from the results of the Corporation prosecution as well we feel safe on those figures.

3365. You feel safe on that?—Yes.

3366. If you take those figures that you have put forward that means also that you must specify that it must be determined by that particular method which your analyst adopts?—We think there should be one universal method of analysis—something settled on by the Society of Analysts. That is a point that we advocate strongly.

3367. It is hardly a fair thing to ask you, but that has been decided by the Society of Public Analysts; I am only trying to get from you whether your analyst is up to date or not, or whether he is aware of this, because he may have been unintentionally misleading you?—What is the method which is adopted if it is a fair question to ask?

3368. (*Chairman.*) This is from a public document, so I think I may read it to you: "Process of analysis of milk used up to 1885, not very perfect. Adam's process gave 0·5 per cent. more fat, and consequently 0·5 per cent. less solids not fat than Wanklyn process. Most public analysts had hitherto adopted 2·5 for fat and 9 for solids not fat as limits. Council of Society of Public Analysts recommended adoption of new (Adam's) process, and, concurrently, an alteration of standard to 3 and 8·5 per cent. respectively. Old standard perfectly correct under old method of analysis; new standard equally correct for new method. Results furnished by analysis of milk can only be judged when process by which they are obtained is known." Therefore the Wanklyn process does not get out as much fat as it ought to under the new process, and it gives more total solids; that is a very important point?—I may say that bears out the analyses we have had made this month. We have nothing less than 9 per cent. not fat, and yet the fats come low, so, of course, as you remark, it bears it out. Our fat is lower, but our solids not fat are higher.

3369. (*Dr. Voelcker.*) Has it struck you at all in your Association that prosecutions would take place at the instance of the analyses of public analysts who worked under a different process to your own analyst?—Yes, but we have never had any conflicting evidence with regard to that in the courts.

3370. (*Chairman.*) Who is the Public Analyst in the City of Manchester?—Mr. Estcourt.

3371. He would work under a different process to Mr. Dancer, surely?—I am not aware that he does; I was under the impression that he worked on the same process.

3372. (*Dr. Voelcker.*) Taking the statistics that you have got there, would you call this a satisfactory record as regards the milk supply of Manchester?—No, as I remarked, those are all suspected samples in the first instance.

3373. (*Chairman.*) Your figures are very interesting, but at the same time they appear to have been drawn up under rather a different method than those which have been submitted to us by the other witnesses; however, knowing what we know, we can judge them at their proper value?—Yes.

SIXTH DAY.

Friday, 23rd March, 1900.

PRESENT:

Lord WENLOCK, G.C.S.I., G.C.I.E. (*Chairman*).

Mr. GEORGE BARHAM.
Mr. GEORGE COWAN.
Major PATRICK GEORGE CRAIGIE.
Mr. SHIRLEY F. MURPHY.
Professor T. E. THORPE, F.R.S.
Dr. J. AUGUSTUS VOELCKER.

Mr. R. HENRY REW, *Secretary.*

DR. ARCHIBALD KERR CHALMERS, called; and Examined.

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3374. (*Professor Thorpe.*) You are Medical Officer of Health at Glasgow?—Yes.

3375. You hold a Diploma of Public Health (Cambridge)?—Yes.

3376. You have given some considerable attention to the question of milk supply, I believe?—I have.

3377. In the case of Glasgow, can you inform the Committee how that city is furnished with milk?—There is a local supply obtained from an actual number of 1,145 cows presently kept, but in addition to that milk comes from 770 dairy farms in the surrounding counties, and the majority of these farms are in the counties of Lanarkshire, Renfrewshire, and Ayrshire. I have taken the numbers accurately for Lanarkshire as 230 dairy farms, 110 in Renfrewshire, and 280 in Ayrshire. That makes 620 out of the 770.

3378. Taking the cows which are on those farms, of what breeds do they mainly consist?—Ayrshire, I should say—almost exclusively Ayrshire, I think, in the far-out districts, but coming nearer the city there is, I believe, a mixture of crossed Shorthorns, and just more recently some Irish cattle, so that probably between 80 and 90 per cent. of the Glasgow milk cows will be Ayrshire only.

3379. And the remainder will be crossed Shorthorns and Irish cattle?—Yes.

3380. You say in the Glasgow byres there has been a tendency towards an increasing proportion of Irish cattle?—That is so recently.

3381. For what reason is that?—I believe it has been discovered they were less affected with tuberculosis; there is less tuberculosis in milk cattle apparently of an Irish breed as they come to us. That is the information I have from our veterinary surgeon, it is not my own knowledge.

3382. Now you have some information as to the average composition of the milk of Ayrshire cows?—Yes, I should say in the inquiry I endeavoured to get some basis by which one might compare the milk as it came from the farmer with the milk as it is sold to the consumer, and with that view I was able to get some figures showing the average composition of the farmers' milk for the purpose of comparing it with what is published as being the average composition of Ayrshire milk, taken experimentally. I mean, I have referred here to some figures given in Mr. Droop Richmond's book. It is stated in one case that the total solids of an Ayrshire cow's milk are 12·70, the fats being 3·68, and the non-fatty solids 9·02. A further analysis by Dr. Bell shows 13·46 of total solids, the fats being 4·24, and the non-fatty solids 9·22. Those figures were taken from a table in Mr. Richmond's book.

3383. Would you kindly give us as shortly as possible what you believe to be the average composition of the milk as delivered into Glasgow from the country farms?—This information is based on an analysis of 25 samples taken from the milk tins in transit either on the railway or from carts when the farms happened to have been more nearly situated. The average of these 25 samples is: total solids 12·52, the fat being 3·73, and the solids not fat 8·79. (*See Appendix* No. X.)

3384. Were these samples all taken during a particular period of the year?—They were taken in the month of September only—the September of last year—they did not extend over the year.

3385. Are you in a position to say how far they would represent the average composition of the milk throughout the year?—Nothing further, except from the general knowledge that seems to obtain that the fats in September are probably increasing somewhat, and it is not the highest; it is not the time of the year when you get as a matter of fact most fat.

3386. We should like to know how far you regard these figures as representing an average condition of things?—For the year?

3387. For the year?—I should think it will more or less represent the average condition taking it for the twelve months—if you allow a slightly higher percentage for the winter months, and a somewhat lower percentage of the spring months. The figures compare favourably with the first of the two analyses already quoted from Mr. Richmond's table.

3388. These samples were, of course, samples of mixed milk?—Mixed milk, but of single farms.

3389. Were they 25 single farms?—Yes, the samples were taken during transit of the milk from the producer to the purveyor in town.

3390. Have you any idea how many cows it would represent?—I made inquiries especially in connection with four farms because in those four the proportion of fat was under 3 per cent.

3391. You have given an analysis of them; nine you say were samples from farms in the county of Lanark, 12 from farms in Ayrshire, and four from farms in Dumfriesshire?—That is so. In Ayrshire and Dumfriesshire farms, two in each county had a proportion of fat under 3 per cent.; and I know that in one of the Ayrshire farms there were 17 cows, and in the other 27 cows. This is information I obtained from the medical officer of health for the county. He had been told on making inquiry at the farmers that the cows in this particular month were many of them just recently calved, and the farmer offering this as a possible explanation of the reduction in the fat. In connection with the two Dumfriesshire farms the cows numbered 13 in one dairy and 12 in the other, and the farmer explained that the grass was beginning to fail, and he had put the cows on cabbages and turnips, and thought possibly that the change of diet might explain the low proportion of fat present. All the others were over 3 per cent.

3392. Was this milk morning or evening milk?—It was morning milk.

3393. Exclusively morning milk?—Yes, they were all samples of sweet milk, and taken in the morning.

3394. Turning to the average composition of retailers' milk, what have you to tell us?—I take that portion of my evidence from a review of 280 samples of retailers' milk. The analyses were made by the analysts under the Food and Drugs Acts in Glasgow—Mr. Tatlock and Dr. Clarke. These samples were taken during the years 1897, 1898, and 1899, and they include all which we regarded as genuine, because the solids were present in excess of the present standard, or fell short only by such fractional quantities that a successful prosecution would have been unlikely.

3395. Have you a table showing the figures?—The details are contained in Table A, and there is a summary in Table B. (*See Appendix* No. XI.)

3396. Would you kindly summarise those?—I have arranged them in months with a view of ascertaining what seasonal variations might take place. In the month of January no samples have been taken. In February during the three years there were 43 observations, and the total solids averaged 12·09, the fat being 3·23, and the solids not fat 8·86. Fourteen observations were taken in the month of March, which showed 11·91 of total solids, 3·09 of fat, and 8·82 of solids not fat. In the three years in the month of April, 65 observations were made, showing total solids 12·01, fatty solids 3·30, and solids not fat 8·71. No observations were made in May. Five observations were made in June (June of 1899 this was), the total solids were 11·90, the fat 3·02, and the solids not fat 8·88. In July, 1898, there were 4 observations, the total solids being 11·77, the fat 3·11, and the solids not fat 8·66. In August, 1897, there were 6 samples showing total solids 11·50, fat 2·83, solids not fat 8·68. In September, 1898 and 1899, 37 samples were analysed showing total solids 12·48, fat 3·60, and solids not fat 8·88. In October of 1898 and 1899 52 samples were taken—I do not mean that was the whole number taken, but the number analysed—and the total solids were 12·17, the fatty solids 3·26, and the solids not fat 8·91. In November, 1898, 18 observations were made showing total solids 12·15, fat 3·32, solids not fat 8·83. In December of 1897 and 1898 there were 36 observations showing total solids 11·98, fat 3·20, and solids not fat 8·78.

3397. Grouping these into seasonal periods, what do they say?—Taking the winter months, November and December (January having no observations), the total solids were 12·07, the fat 3·25, and the solids not fat 8·82. In the summer months, that is from June to August, the total solids were 11·73, the fat 2·99, and the solids not fat 8·74; in September and October the total solids were 12·32, the fat 3·43, and the solids not fat 8·89. In the spring months, February, March, and April, the analyses showed 12·01 of total solids, 3·21 of fat, and 8·80 of solids not fat. That would indicate that the richest milk is delivered to the consumer in September and October, when the richest milk is obtained from the cow in the winter months. It is to be noted that the lowest proportion of fat in these samples occurs in August, but you will note that the samples for June, July, and August are few; only 15 having been taken.

3398. Have you got any particulars of these six samples that were taken in August, 1897?—These details are contained in Table A—shall I read them?

3399. I only want to know how this rather low average was obtained—whether it was by the inclusion of one or two extremely low numbers, for instance; on the whole one sees that in August they were all under 3 per cent.?—With one exception.

3400. Now then the retailers' milk; I suppose nothing was known whether it was morning's or evening's milk?—Nothing was known as to that.

3401. What are the probabilities that it would be one or the other, or would you infer that it might be half and half, or something like that?—I think it would contain certainly a large proportion of the morning's milk,

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because the samples are taken usually in the forenoon, so it should be morning's milk, unless you assume that some of the milk of the previous evening had been added.

3402. Have you anything more to say with respect to the retailers' milk and these figures that you put in in regard to it?—The autumn months September and October have a higher proportion of fatty solids than November and December, which is contrary, I believe, to observations based on analysis of the actual yield of milk cattle; but in Glasgow there is a custom of mixing milk—I imagine that obtains elsewhere also—so that what one consumer gets is probably the mixed milk of several herds—not the milk, unless by arrangement, of any particular herd.

3403. Do you mean that the consignee—if I may so call him—of the milk in the first instance mixes the product of several farms?—That is so. He probably receives the output of several farms, and instead of selling each farm's milk separately, it will suit his trade much better to mix them, and what the consumer gets is part of the mixed yield of whatever farms are in the retailer's possession at the time. The delivery you see will take place at various hours in the morning, and the dairyman will begin retailing just what he has in hand, adding to what is left of that which comes in subsequently.

3404. For what purpose does he mix the milk, do you imagine?—First of all I should think it is for convenience; but there is obviously an advantage in having his milk more or less uniform in composition.

3405. Provided he is above the so-called official standard, why should he concern himself about making it uniform?—A very rich milk will partly help to give a higher proportion to all milk that is not quite so rich.

3406. That is, you think, what it is done for?—I only want to get out what you know about this practice?—I think first of all the custom would arise simply from convenience—it would be more easy to sell his milk just in this way.

3407. You mean he helps along a comparatively poor milk by the addition to it of what he believes to be richer milk?—That would certainly be one of the results. It is an advantage for the consumer too—it secures him a fair proportion of the fatty constituents. But in another table it would appear that this suggests to some retailers a form of mixing which has become adulteration. In the next table (*see Appendix* No. XII.) I have taken the analyses on which prosecutions have been based, and separated them into the prosecutions of farmers, which will be for adulteration of his own output, and the prosecutions of retailers as representing the results of mixing. This contrast is presented: the table contains details of the analyses of 74 samples on which prosecution followed in respect of a deficiency in the fats or in the non-fatty solids; 21 of these are farmers' milks, and 53 retailers' milks. The average composition was as follows—in the farmers' milks the total solids were 10·25, the fats 2·96, and the solids not fat 7·29; the retailers' milk showed 10.91 of total solids, 2·23 of fat, and 8·68 of solids not fat.

3408. I do not know what the exact significance of it is; of course, it may be anything; 74 samples of milk were taken on which prosecutions followed, 21 of them for farmers' milks and 53 for retailers' milks. These are, of course, in a sense accidental figures, depending upon the degree of adulteration?—Yes, they are simply averages, but the details show that the retailers' deficiency is almost invariably in fat, whilst in the farmers' deficiency the fats have been in excess of the standard, and the solids not fat have been reduced.

3409. What do you infer from that?—In the farmer's case the simple addition of water would explain the position.

3410. And in the retailers' case?—In the retailers' case it suggests an adulteration with skimmed milk or separated milk.

3411. (*Chairman.*) Or might it be that the retailers have taken off a certain amount of the cream, and sold it as cream, and then sent out their milk minus the fat?—That also would explain it.

3412. (*Professor Thorpe.*) It is the practice in Glasgow, we are informed, to sell a relatively poor cream as cream?—Yes, it is. I think the proportion of fat in cream in Glasgow is rarely above 15 per cent. on the average of the cream sold.

3413. Is it possible, do you think, that a certain quantity of cream is got in this fashion? I mean by allowing the milk to stand for a little time, and then taking a portion of it away as cream?—That may be, but my impression rather is that the reduction in the fatty elements is produced by the addition of skimmed or separated milk.

3414. Are you aware whether it is the general practice of the retailers to have their milk cooled before it is delivered to them, or do they do a warm-milk trade?—It very much depends on the extent of the business. The smaller farmers have no method of cooling.

3415. The farmers who supply them would do the cooling; do they, or do they not, cool the milk?—In many cases they do.

3416. But is it the general practice, or not?—I have no information to what extent the custom obtains.

3417. Coming back to that point about the mixing, I should be glad to be quite clear about that. Is it the general practice among the retailers in Glasgow to mix their milk previous to distributing it?—I believe it prevails to a large extent. What one sees from the figures is that in only 41 of the 280 samples of retailers' milks which I have given has the fat approached or been in excess of the proportion of fat present in the farmers' milks; all the others are very much under the farmer's proportion. The proportion of fat in the milk as sold is not so great as in the milk derived from the farmers.

3418. You are speaking still of the same Table, are you?—No. I am referring now to Table A, which deals with the milks regarded as genuine.

3419. What I really want to get at is this: We have had it in evidence from gentlemen representing Dairy Associations in Glasgow that they rather plead for a comparatively low standard on the ground that they may be judged by the product of even one cow, or at most of a few cows; that contention is negatived, or at all events very considerably weakened if we can find that it is the practice amongst the retailers of Glasgow to mix the product which they get from various farms, so as to minimise the chance that they are dealing with a product of a very small herd, or even of two or three cows. If you assure us that it is the practice in Glasgow for the retailers thus to mix the milk, the chances that the consumer will get in this way a very poor milk, although it may be the genuine product of the cow, are, of course, very considerably diminished?—Yes.

3420. Can you tell the Committee of your own knowledge that it is the practice among the vendors of milk, the retailers of milk, thus to mix their milk?—I understand, without having any definite knowledge, that it is so; and it certainly is to be inferred from the figures. In none of the months where I have taken out the seasonal variation does the proportion of fat come up to the proportion of fat present in the farmers' milks as I have it in the 25 samples.

3421. What have you to say about the forms of adulteration which you know to occur?—That I have endeavoured to show in the table, where the proportion of fat in the adulterated milks, for which convictions were got, was in excess of 2·75, when farmer's milk was in question, whereas in the retailers' form of adulteration it is the fats usually that are deficient.

3422. What you mean is, therefore, that the general form of adulteration by the farmers is the addition of water, and the general form of adulteration by the retailers is the abstraction of fat?—Yes, or the adding of skimmed milk.

3423. It comes to the same thing?—Practically.

3424. It is either the direct abstraction of fat or the addition of skimmed milk?—Yes.

3425. I believe you have got some remarks to offer to the Committee about skimmed milk?—I have a record of 16 prosecutions for the adulteration of skimmed milk, based in each case on a reduction of the non-fatty solids, indicating dilution with water. The fat present varied in the different samples from 0·42 to 1·90 per cent.; and the average was 1·18 against 1·43 per cent. of fat in 16 samples taken during the same period, and regarded to be genuine, the lowest of which had 0·75, and the highest 1·79 of fatty solids. Recently a decision in the Sheriff's Court at Paisley failed to convict a purveyor of skimmed milk, which milk only contained 0·36 of fat; the prosecution contending that it was separated milk, and not skimmed milk, as we understand it.

3426. Perhaps you had better explain that to the Committee. Do you mean that these prosecutions were instituted, because the purchaser got something which was not of the nature, substance, and quality demanded?—That is so.

3427. He asked for skimmed milk, and he got separated milk?—Not quite that. He asked for skimmed milk, and he got something which was diluted with water, in respect that the solids not fat were below the accepted proportion. That was the contention in the Glasgow prosecutions and convictions were obtained.

3428. You quote in your *précis* a case which was tried at Paisley, where a charge was brought against a purveyor of selling, as skimmed, separated milk which had 9·33 per cent. of non-fatty solids, and only 0·36 of fat; what was the allegation there?—That it was not of the nature, substance or quality demanded. It was endeavoured to establish that the deficiency in fat below what was regarded as being the average quality present in skimmed milk constituted the adulteration; the Sheriff decided that it did not.

3429. What the prosecution sought to make out was that a man was prejudiced if he did not get even in skimmed milk a certain quantity of fat?—Yes. I think it is commonly accepted that you cannot reduce the fat by hand skimming below a certain proportion, but that by separating milk you can take out much more fat.

3430. That is the point. Therefore the man asked for skimmed milk, and was served with separated milk?—Yes.

3431. That was thought to be an offence?—Yes.

3432. The Sheriff decided otherwise?—Yes, he decided that it was not an offence; still I think there is some value in distinguishing between separated milk and skimmed milk, because skimmed milk is very largely used as an article of diet, and so long as fat is present in it, it is obviously more nutritious than milk without fat. I do not know that the public quite understand the distinction between a separated and a skimmed milk.

3433. Probably not, but what are we to gather from this—that you wish this Committee to set up a standard as to what skimmed milk shall contain of fat or what is the relevance of this?—Probably not necessarily a standard, but that when separated milk is sold, it shall be sold as separated milk; that one shall understand when buying separated milk that he is buying something which has less fat in it, less nutritive value than what he would get if he bought what he understood to be skimmed milk.

3434. How, apart from a standard, is that to be determined; how are we to ascertain that it is either skimmed or separated milk apart from a standard?—There is an apparent impossibility of skimming milk—of reducing the fat in milk by ordinary skimming—below a given proportion.

3435. You think that ordinary hand-skimmed milk must have a larger proportion of fat in it than machine separated milk?—I believe that is the case; I believe skimmed milk will sour before you can get much below 0·8 per cent.

3436. Very well; if that be the case (I do not express any opinion about that), does that not implicitly require some definition of the amount of fat which should be present in hand-skimmed milk?—Yes, it would imply that.

3437. Do you suggest that the Committee should take that into consideration, and define what amount of fat should be present?—I am not quite sure that it necessarily follows that a standard should definitely be fixed, provided it were understood that when a man asked for skimmed milk he should be supplied with something containing this proportion of fat.

3438. The difficulty is to prove the thing. How can we prove it? Supposing a man put up a label and falsely described his milk as skimmed milk, whereas he was really selling separated milk, how can the fact be proved?—I am afraid one must accept what is stated by analysts that anything under a certain proportion of fat is necessarily separated.

3439. Then I again put it to you that that implies a definition of the amount of fat which is to be left in?—Yes, it would imply that the fat did not fall below a certain standard.

3440. You see the amount of fat is the only criterion apparently which serves to distinguish between the hand-skimmed milk and machine-skimmed milk?—That is so.

3441. Therefore, a certain amount of fat must be defined as to what constitutes the difference?—Commercially I think they are quite distinguishable; I think the dealer in milk quite understands that there is a difference between skimmed and separated milk.

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3442. The dealer understands it?—Yes, the seller does; but I think it would be almost impossible to get into the consumer's knowledge the fact that he got one or the other; it seems certain that some injustice is sure to follow to the consumer especially in the case of children, who in the poorer households are fed largely on skimmed milk. They do not understand by skimmed milk any mechanically separated condition of things. They know what skimmed milk has been by custom.

3443. If I understand your line of thought it is this: the ethics of the position seem to show that by use and wont people using skimmed milk have a right to expect a certain quantity of fat in it?—Hitherto they have been accustomed to have a certain quantity of fat.

3444. Machinery, however, has come along, and the effect of that has been to deprive them of the fat to which they have hitherto been accustomed?—That is so.

3445. And you think they are thereby prejudiced?—I do think so. Where children are fed on skimmed milk it is clearly an injury if instead of the skimmed milk they have been accustomed to have, separated milk is supplied to them.

3446. What have you to tell us about cream?—There has been little done, I think, in Scotland generally in connection with cream of late years. A decision by the Justiciary Court in 1877 was sustained on appeal by the defender against a conviction obtained in the Sheriff's Court of Glasgow under Section 6 of the Act on the ground that nothing foreign to the nature of cream had been added, and that defects in quality were not to be regarded as coming within the purview of the section which was intended to meet the addition of substances foreign to the thing itself.

3447. What is your recommendation?—Some standard, some grading at least of the proportion of fat present in cream would be an advantage. First and second quality cream I think is a phrase in use in some parts of the country.

3448. You are, of course, addressing yourself more particularly to the circumstances of Glasgow?—Yes, that I know best.

3449. Where the conditions we are given to understand are somewhat peculiar as regards cream?—That it is very watery, with a small proportion of fat?

3450. No; I mean your habits and the way in which you use what is called cream are somewhat different, certainly, to what we do in England, or even to what is done, I believe, on the east side of Scotland?—Yes; I think there is a tendency to use cream or whatever is called cream, by families who can procure it.

3451. In view of the fact that we should be simply dealing with a local custom, is it possible to make any definite recommendations as to grading cream which should obtain for the whole of the kingdom?—Not if the local custom differs from the rest of the kingdom.

3452. It is the case, is it not, in Glasgow that the local custom differs from the rest of the kingdom? (*A pause.*) What have you to tell us about condensed milk?—Just what is common knowledge in the matter; when a purchaser buys condensed milk he should know definitely how much water he must add to bring it up to any standard of sweet milk that may be adopted.

3453. That might be met by defining the amount of fat and solids not fat which the milk itself contained, and stating that it should not fall below a certain amount?—That the condensed milk should not fall?

3454. Yes; would it not be simpler to say that the condensed milk should not fall below a certain amount of fat, or a certain amount of non-fatty solids, rather than to say how much water may be added to bring it back again to the composition of normal milk?—I was thinking rather of the point of view of the consumer, who scarcely understands proportions of fat, but might readily understand volumes of water. It is quite obviously, as you put it, the more scientific way; but I am thinking of it in the light of the consumer who has no knowledge of standards, but might readily add whatever proportion of water the label told him.

3455. Are you aware what degree of condensation condensed milks are subjected to?—I have some figures, but I have otherwise no knowledge.

3456. What are your suggestions as regards the question of a standard for milk?—I think if the farmer dis-

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posed of his milk not by the quantity but by the fat it contained, there might be less of contrast than exists between the amount present in the farmers' milk and in the retailers' milk; taking the analyses of the farmers' milk the present standard would seem much too low.

3457. What do you mean by the present standard?—The one which is accepted; the 2·75 which is accepted as indicating genuine milk at the present moment.

3458. (*Chairman.*) In Glasgow?—Yes.

3459. (*Professor Thorpe.*) That you think is distinctly too low—2·75?—I do.

3460. What would you suggest in the way of replacing it?—I find this average, for instance, comes out to 3·73 of fat.

3461. You would not suggest our taking the average, would you?—No, but 3 per cent., if not in winter 3·25, would seem to be quite within the range of cattle at the best milk yielding period. I take it simply as general knowledge that if you keep milking cows to any age you may get any diminished proportion of fat; but that if you take the proportion of fat in the milk of cows, especially in the earlier years, you will have no difficulty in getting a standard of 3·25.

3462. Then do you advocate that the standard of fat should be 3·25?—I think that might be the standard taken as the winter's yield.

3463. (*Chairman.*) What do you call the winter—how many months?—November, December, and January, apparently, are the months in which the richest milk is yielded.

3464. (*Mr. Cowan.*) What about October?—September and October in the case of the retailer's milks are the months in which you get the largest quantity of fat; but from Mr. Richmond's tables, and from observations conducted with a number of cows throughout the year apparently it is in the later months of the year that you get the higher fats.

3465. (*Mr. Barham.*) Would it not be better to deal with your own figures rather than to deal with Mr. Richmond's, of which you know nothing?—My own figures are only referable to the month of September.

3466. (*Professor Thorpe.*) What, however, I gather is that you are inclined to recommend two standards—one for one period of the year and one for another, is that so?—Yes, I think that might be accomplished. It would follow a natural variation in the quality of milk as obtained from the animal.

3467. You think that for the six months which you may call the winter half of the year—the winter and the early spring—you would recommend 3·25 of fat; is that your suggestion?—If you limit the period a little, from probably November to January, and said that for the rest of the year it is to be 3 per cent. of fat.

3468. Then for three months of the year you would suggest 3·25, and for the remaining nine months you would suggest 3 per cent., is that it?—Yes. That is a custom in some of the American States; I think Massachusetts is an example.

3469. Massachusetts, is it?—Yes, Massachusetts has 3 per cent. from April to August, and 3·7 of fat from September to March.

3470. Is there another state that follows the same practice?—Ohio; from May to June it is 2·8 of fat, and from July to April 3 per cent.

3471. Of course, Ohio and Massachusetts are somewhat geographically widely distributed, and it may be that that is the cause; but, however, the practice is not uniform. You suggest in other words then, that we should adopt a somewhat similar procedure here, and that we should have during three months, at all events, of the year, a standard of 3·25, and for the remaining nine months a standard of 3; is that it?—Yes, I think that might be accepted; I think that the farmer would have no difficulty in producing a milk of that standard.

3472. What else have you to say with respect to the standards; is the sole criterion to be the fat?—It is the most valuable from a nutritive point of view. Regarding the solids not fat, I have no opinion definitely. I take the chemist's view of the proportion of solids not fat, and I have no opinion of my own to offer on them.

3473. Of course, speaking as a medical officer of health, you know that the solids not fat contain a good deal of the nutrient matter of milk?—Undoubtedly, but from the commercial point of view I should very much doubt whether it pays the retailer to dilute for that purpose.

3474. Have you any further observations to offer respecting the standards?—In accepting the milk of any cow as influencing the question of standard by reason of its composition, it would seem to be of importance to keep in view first of all, that the animal should be a healthy one, and secondly that its age should be within a given limit. I understand that farmers who breed and rear their own cows seldom care to keep them over eight years; on the other hand, the average age of the town-stalled cows in Glasgow is from seven to eight years, and the average composition of the milk would be poorer than if the average age were lower—that is, if you reduce the age of your milk cattle you would stand a better chance of having a richer milk.

3475. That would be brought about surely by the operation of the standards?—Quite so.

3476. Also in regard to what you have to say respecting the influence of feeding, in so far as feeding has any influence at all, of course the standard would bring about a proper condition of things as regards feeding?—Feeding seems to have some influence—indeed a considerable influence—on the quantity of the milk; but I do not understand that it permanently influences the fatty constituents very much as far as quantity is concerned. I rather think that it is said to influence the amount of butter you can extract from milk, but of that I know nothing personally.

3477. (*Dr. Voelcker.*) The farmers' samples were all morning's milk?—Yes.

3478. Do you know how many times a day the cows are milked in the districts that supply Glasgow?—I believe mornings and evenings. So far as I know the custom it is this, that in the farms more remote from town their evening milk is kept and skimmed, and sent in the following morning as skimmed and cream along with the morning's yield as sweet milk.

3479. In the case of the cow sheds in the town, are the cows milked twice or three times possibly?—Twice, I understand.

3480. Only twice; in some towns in Scotland it is the case that cows are milked twice or three times?—I am aware of that.

3481. You have nothing to tell us of the difference from your own experience between morning's and evening's milk?—No, I have no knowledge of that.

3482. But you may take it generally that as your farmers' samples were samples of morning's milk the evening's milk would probably not show a lower quality?—Not a lower quality; I understand evening milk is richer in fat.

3483. These analyses were done by an exhaustive process, I suppose?—They were done by the analysts appointed under the Food and Drugs Acts.

3484. Your analyses do not carry out the contention that Ayrshire cows give a milk of not above 2·75 of fat?—Oh, dear no.

3485. It is well above that?—3·73 is the average of the samples given.

3486. We have had it stated here that 2·75 is a fair percentage of fat to expect from Ayrshire cows?—That is not shown from those figures.

3487. Is there any particular reason why samples were not taken in January and May?—No; it is one of the things which happen without any apparent explanation.

3488. Can you give any reason for the samples in September and October (these are retailers' samples, I think), being richer in fat? There is not such a large demand in towns at that time of the year?—But the holiday season does not fall in Glasgow in September, so much as in other parts; and practically it will be returning to its usual condition of consumption.

3489. You do not think that the demand for milk at other times of the year being greater would lead to the percentage of fat being lower at other times and higher in September and October?—I scarcely think that would explain it in October.

3490. Might it have something to do with it in September?—It is just possible. The figures on the whole I rather think suggest that between the farmer sending his milk out, and the consumer getting it, some sort of manipulation takes place.

3491. You have suggested that manipulation has gone on, and I put it to you whether the fact that the milk is richer at those times may not be the result of there not being so much need for manipulation?—It is quite a probable explanation, I think.

3492. It is not possible, as far as you are aware, to discriminate between the addition of separated milk or the removal of fats?—I think that the solids not fat would be increased.

3493. You cannot give us any experience of your own on those points?—No, not of my own.

3494. Taking Table IV., showing the different forms of adulteration, and the remarks upon them, the expression there "deficient in fat" may apply equally to the removal of fat by skimming, or to the reduction of fat owing to the addition of separated milk, may it not?—Are you referring to the retailers' samples?

3495. I am referring to the remarks on the retailers' samples?—The proposition was based on the deficiency in fat.

3496. That deficiency of fat may be, as far as you are aware, the result of skimming or of an addition of separated milk?—So far as the fat is concerned, yes.

3497. But your belief is that the common form of adulteration in retailers' samples is to add separated milk?—Yes. to add, I think, probably separated milk and water. I rather think if you added separated milk alone the solids not fat would be increased.

3498. But you are not prepared to give us anything definite on that point?—I am not prepared to do so.

3499. With regard to the skimmed and separated milk, you think yourself that there ought to be a clear distinction drawn between those two kinds?—I do.

3500. And that in the interests of the public and of children in particular there should be this clear distinction?—I think so. I think it is decidedly in the interests of children that they should not be fed on separated milk.

3501. The practical difference between the two is in the amount of fat that is left?—Yes.

3502. Would it not then, as Professor Thorpe suggested, be the only way that this Committee should fix a definite standard for the one or the other; if you do not have a standard, how else are you to discriminate between them?—Unless the sale of separated milk as skimmed milk were prohibited.

3503. But what is the test to be?—The test would be the proportion of fat.

3504. Supposing a man took the two and mixed half and half—half skimmed and half separated?—It would ultimately come back to a determination of the quantity of fat, there is no doubt.

3505. That is what I mean; it would come back to a determination of the fat?—Yes.

3506. Do you know to what extent the fat can be reduced by hand skimming?—I believe to about 0·8; to keep the milk longer would seem to sour it under ordinary conditions.

3507. That you have mentioned from general knowledge I suppose?—Yes.

3508. And only from general knowledge, I suppose?—Yes.

3509. But a very much lower percentage can be reached in the case of separated milk?—Yes, I think 0·3.

3510. You are not prepared yourself to suggest anything with regard to the standard of total solids for one or the other?—No.

3511. Do you know anything about there being a very large use of butter-milk in Glasgow?—I think the custom is rapidly falling into abeyance. Butter milk at one time was much more largely consumed.

3512. Can one tell by taste or appearance whether one has got butter milk, or separated, or skimmed milk?—Butter milk and separated milk have different tastes; I mean separated milk is simply skimmed milk, which has not soured.

3513. If you were to keep the separated or skimmed milk till it got sour could you tell them?—It is a question of palate; I do not know that one can speak as to that.

3514. Presuming there could be a difference, would you suggest any standard for butter milk?—No, I have no standard to suggest.

3515. Would you consider it desirable in the public interest, or from the point of view of health, that there should be a distinction drawn between what butter milk should consist of and what separated or skimmed milk should be?—I do not think it is a matter so directly affecting health, because children are not fed on butter milk.

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3516. But you would consider it very desirable, would you not, that there should be a clear distinction drawn between skimmed and separated milk?—I would certainly.

3517. And you are inclined to agree now that that can only be done by fixing a standard for one or the other?—Yes.

3518. In regard to cream, do you think it would be impossible to draw up any grading system for the different qualities?—There would be an advantage, I think, if it were possible to definitely state whether in buying cream you had one quality or another.

3519. Do you know how many different qualities are sold in Glasgow?—Two only, I think; I mean on an average sale. Of course, one may arrange for any kind of cream.

3520. Are those two qualities thick and thin?—Yes.

3521. Do you know at all what amount of fat either of those has?—I think the thin has about 15 per cent. of fat, but that is not based on any analysis.

3522. Taking the thick, of course that is sold more to fetch a higher price?—Yes, and at the request of particular customers.

3523. But you would consider it desirable that even in the case of thin cream there should be a minimum standard of fat fixed?—That is so.

3524. So that if a consumer liked to make it thinner afterwards himself he would be at liberty to do so?—Quite so.

3525. But that he should know that he was not getting below a certain percentage of fat?—Yes. The difficulty always in the poorer districts is that there you have the people obtaining their supplies from carts, probably not the same cart, but any cart that is convenient.

3526. Then with regard to the condensed milk; your views as to the desirability of stating the amount of water that should be added to condensed milk to make it up to the composition of original good milk are based upon considerations to the health of the people?—That is so.

3527. And you think it would be desirable that a declaration should be made as to the quantity of water necessary to add?—I think that would be more easily understood by the average buyer than if it were stated simply in percentages of fat.

3528. But then it must depend very much upon what the composition of the original milk used was?—Obviously, but I was thinking rather of the difficulty the consumer is in.

3529. Supposing the skimmed milk had been used for condensing?—Then no dilution would bring it in that case to the composition of sweet milk.

3530. Would it not then be desirable to state either what amount of fat was in the condensed milk as sold or to make a statement as to what the amount of fat in the original milk used for condensing was in order to secure that when diluted a proper amount of fat should be given to the purchaser?—I think obviously that is the scientific way of expressing it.

3531. That is what I mean. Then my last question is—have you any experience of the use of preservatives or the need of preservatives in either milk or cream?—Several of those samples of milk are noted as having boracic acid in them. In Table A several are marked there; one with 51 grains of boracic acid to the gallon, another with 8, and another with 40.

3532. Is it the case that any prosecutions have followed in Glasgow in consequence of such an addition?—I have not any details of that.

3533. You do not know whether it is the practice to report that as an adulteration?—It was until this question came before the Preservatives Committee. Things are in abeyance now pending that Committee's report.

3534. Have you any views yourself as to the need in the supply of the milk to Glasgow, for instance, of using preservatives?—One approaches that question from the point of view of the delicate child or the invalid.

3535. I am speaking of the necessity for preserving the milk; is there any practical difficulty with regard to the keeping of the milk supply of Glasgow without the use of preservatives?—I think not, if the milk is sold as it is produced.

3536. What are your views with regard to the health of the consumers?—That it is adverse to health.

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3537. (*Mr. Cowan.*) I think you have stated that a large quantity of separated milk goes into Glasgow; I think there is a good deal, principally from the creameries, is there not?—I have endeavoured to get some knowledge of that from the railways, but they tell me that it is all booked simply as milk; it is simply "milk" in their invoices.

3538. Is it the case that there is no distinction made in the selling of separated milk and skimmed milk in Glasgow, and that they are both sold as one?—I am not quite sure that I can answer you that definitely. The decision in Paisley has made it impossible for any action to be taken. In 1898 I have a record of two or three analyses where the proportion of fat was probably suggestive of separated milk: but there is no further definite information that I have.

3539. Does not that decision at Paisley bear out my question to you that the probability is skimmed and separated milk are both sold as one in Glasgow in the meantime?—I should think the custom in Glasgow would follow Paisley, and would be pretty much the same as Paisley.

3540. In answer to Dr. Voelcker you stated that it would be really necessary to fix a standard for skimmed milk; did you go as high as one per cent.—I forget?—No. The proportion of fat in the average of the skimmed milks was 1·43 in sixteen samples taken in the period that I referred to.

3541. Would you suggest that there should be a standard of 1 per cent. fixed for skimmed milk to distinguish it from separated milk?—I did not approach this question of skimmed milk so much with the conception of fixing the standard, but with the view of making it clear to the purchaser what he was buying.

3542. You seem to say it is necessary in order to do away with the use of separated milk as skimmed milk that there should be something done?—If that is the only way of accomplishing it, then the fixing of a standard for skimmed milk would follow.

3543. Can you suggest a minimum?—I only take it from what analysts tell you—that in the ordinary separation of cream the milk will sour before you can go below 0·8 per cent.

3544. Then that would be your minimum?—That is the minimum apparently, but the average quantity of fat present is in excess of that.

3545. Is it the case that there is a great deal of condensed milk used in Glasgow?—Yes, I think there is a good deal of condensed milk used.

3546. It is used principally by the working classes for their children?—I think they use it pretty largely.

3547. What amount of fat would you recommend that there should be shown in condensed milk?—That I think I endeavoured to answer previously by suggesting that the dilution necessary to bring it up to the standard of sweet milk should be fixed.

3548. Then in that case you would think that the standard that is fixed for full milk should be the same in condensed milk, and should not be under that?—That by dilution it would reach that—by adding so much water the mixture would then be of the composition of standard milk.

3549. You mean that when it was diluted it should not be under the standard that was fixed for full milk?—That is so.

3550. Could you suggest the minimum standard for cream?—The proportion of fat in cream, do you mean?

3551. Yes, the minimum proportion?—No, I cannot.

3552. You spoke about 15 per cent., but I think we have had it in evidence before us that it is sold at a much lower percentage than that in Glasgow, as tea cream?—Probably that may be the case, but I was not aware of it. Since the Justiciary Courts' decision, practically, the question has been left open.

3553. In your opinion, would it be well that there should be a minimum for cream?—I think certainly, there should be grades of cream.

3554. That is all right; but it would require to have a minimum to begin with?—Quite so.

3555. I gather from what you said that you are of opinion that it should be about 15 per cent.?—Fifteen per cent. is what I understood to be the present proportion.

3556. Of the minimum?—Of the average quantity of fat in cream as sold.

3557. (*Chairman.*) Or, rather the quantity of fat in average cream?—Yes, in average cream as sold.

3558. (*Mr. Barham.*) Your recommendation of 3·25 and 3 per cent. is based on the average that you have obtained from these farmers' milk that you have analysed from different districts supplying Glasgow, is it not?—It is based on that analysis and on the influence that age and other considerations will have on the fats in the milk yielded. If that were fixed as a standard it would then be quite a possible thing for the producer of milk, either by arranging the age of his cattle—chiefly that, I daresay—to reach it.

3559. You have based it, have you not, on the milks that you have received from the farmers, and not upon the average of the results of the milks that had been purchased from the retailers?—That is so.

3560. As one of the means of arriving at those figures you would suggest that all cows of eight years and over should be killed?—If they did not produce a milk of a reasonable quality they should not be kept as milk producers.

3561. Do you know that many cows are in the height of their profit at that time?—Possibly; I was thinking rather of the fat than of the profit.

3562. Exactly. Then this 3·25 and 3 per cent. of fat you suggest have been based on averages, and not on the minimums of any particular months at all?—On the minimums of months, do you say?

3563. Yes, or on the minimums of farms. For instance, in your first Table you show that 15 per cent. of the milks which you derive from the farms was below your lowest standard, although they were procured in the month of September, which according to your retailers' figures is one of the best months in the whole year?—The four farms in that first table giving the milk of less than 3 per cent. are subject to the explanations given by the farmers.

3564. Do you not think that farmers are compelled to use foods of various kinds according to the condition of their crops, and that sort of thing, and that they must vary them from time to time—I forget what you told me with regard to those farmers, but I think you said that one was using mangolds, and did you say turnips or something of that kind?—Cabbages or something of that kind.

3565. You would exclude cabbages altogether from a farmer's food for his dairy cattle?—I should not think it would be necessary to exclude them. What he said I think was that he had more largely introduced those because of the failure of something else—of the hay, I think.

3566. Exactly, and then when we get a drought and grass fails, the farmer must feed on the produce of his farm at the time?—Yes.

3567. You would exclude all that milk—I mean it follows, does it not?—May I take it that the milk would be so much reduced by that?

3568. You say so—it is your own evidence from what you have obtained from the farmers?—You see, in connection with one county the farmers explained that their stock had recently calved.

3569. Would you prevent a stock which had recently calved being used—would you not put that milk in. I mean would you not sell that milk?—I was thinking that the farmer's statement there is to be looked at in this way—that the milk he sent up was the milk of cows far advanced in lactation.

3570. "Recently calved"?—No, the recently calved cows were excluded: I take it they were calving at the time; I take it that is what he meant.

3571. Have you his letter? I do not think he meant that. I think he must have meant that the cows were in the full flow of milk after the first week, and therefore the milk was rather poor for that reason?—The letter is from the medical officer of health of the county. He says, "The only reason the farmer can give for the low amount of fat is that a number of his cows were newly calved." That is on one farm, and in the second farm he says, "Also in this case several newly calved cows; the farmer thinks this might account for the small amount of fat."

3572. That means, does it not, that he was putting in the milk, that he was using milk, from cows that had recently calved?—I read it quite the other way.

3573. Reading it now, do you not think it would bear the inference which I suggest to you?—It might, but one would expect a richer milk in that case, of course.

3574. No, I think not; the first week it would probably be very rich in butter fat, but after that the cow would be in the flow of her milk, in the first flush of her milk, and for three or four weeks the milk would be abundant, but the quality would be rather poor?—Quite so.

3575. I do not want to give evidence here, but I think we have had that in evidence before us. Then, although 15 per cent. of these milks that were obtained from the farmers in one of the best months of the year were below your minimum standard, you would still fix that standard, would you—would you exclude those milks, or what would you do with them?—One would want to know more about the particular cows that gave the milk that produced this analysis—the age of these animals and other conditions.

3576. I see although you have got these figures you are not altogether satisfied with them?—I do not think any figures can be taken without a further knowledge of the animal and the conditions.

3577. Does that apply to your higher standards by which you get your average—say, the 5·50 and the 4·67? —As a matter of scientific accuracy it would be necessary; as a matter of scientific inquiry you would require to know, but in respect that the fats present were of a fair quantity the condition of the animal as a milk-producer was obviously good.

3578. Who sampled these milks?—The food inspectors.

3579. Did they sample them at the station and in the carts?—Quite so; in the station or in the cart, where cart transit was possible.

3580. Have you ever been present when the inspector sampled the milk?—No, I have not been present.

3581. You do not know what process he adopts?—I do know that they shake the butts, and put in a dipper.

3582. They do not empty the vats right out into another vat, and then back again?—No, they shake them.

3583. Then you assume that the whole of these milks (for the sake of comparison I am speaking of now) obtained from the farmers, and the milks obtained from the retailers were all of the same meal; you have practically told us so?—Regarding the farmers' milk, I think there is no doubt that it was morning's milk; the other was simply the milk that was sold in the forenoon.

3584. Exactly, and therefore it would be in the ordinary course of business the milk that had arrived on that morning?—Well, that is possible.

3585. The retailer would not desire to sell his milk 12 hours later than he got it; he would like to sell the milk as fresh as he could for the sake of his own reputation?—Yes.

3586. You are dealing with averages entirely, as far as I can see?—Yes.

3587. In Table B you are aware also that there are four months of the year in which the averages of the good, the bad and the indifferent—(I know all adulterated samples are excluded from these)—are either below 3 per cent. of fat, or very dangerously near it?—In June, July, and August?

3588. In February, in March, in June, and in August? —The fat for February, March, and April is 3·21.

3589. I have not taken those; I have left those; I think you are going to the bottom. But I am not going to the bottom. I am taking the figures for the twelve months, or rather the figures for the ten months above, and dealing with the average of each month. For January you have no observations?—No, and in February, 1897, the average fat is 2·94.

3590. March, 1897, has 3·09, June, 1899, 3·02, and August, 1897, 2·83?—Yes.

3591. So that four months out of the ten, even if we deal with these figures by averages, we are either below the 3 per cent. of fat, which you recommend, or dangerously near to the margin?—Of course, that is retailer's milk.

3592. Yes, I know, but you have excluded all the adulterated milks from these samples, and you have brought these forward here; of course milk must be obtained from the retailer?—Yes. My endeavour was to contrast the milk sold to the consumer with the milk as obtained from the farmer.

3593. Now, I am sure you do not desire to say anything that would be unfair or unjust to anybody—I am sure you do not?—I hope I do not.

3594. But do you think it is fair to contrast milk which has been taken in the month of September from the farmers with that sold by the retailers in all the whole ten months of the year, which include the inferior months?—That is obviously an element in the comparison which must be taken into account, but I could obtain no further figures.

3595. Then it cannot be a fair comparison?—I think you may take September as fairly representing the average of the year, because it is not so low as it might be earlier, and it is not so great as you might have it later.

3596. You know that the Inland Revenue Department, I daresay, obtains samples of beer from publicans; do you think it would be fair to compare the sample obtained, say, in September from one brewer with the sample obtained from another brewer in the month of April, and to prosecute the retailer upon that basis?—I cannot tell; I do not know anything of Inland Revenue customs.

3597. Do you know it is the custom of the Inland Revenue Office—here I speak under correction—to obtain a sample from a publican—from the retailer—and then to compare that with a sample obtained from the same brewer, and I presume at the same brewing?—If you say so I accept it.

3598. If that is so, do you think it is fair to come here making suggestions with regard to the retailer, based upon the milk of only one month, and one day of that month, and that month September?—If you take the month of September alone—the retailer's September—you still have less fat than you have in the farmer's September. The average of 37 observations is 3·60.

3599. September and October?—No, September alone; and the minimum is 3·3.

3600. Where shall I find that; in Table B?—Yes.

3601. The average is 3·60?—Yes; the retailer's fat was less, you see, in September than the farmer's fat.

3602. But you observe that the average there is 3·60, while the average of the farmers is 3·73?—That is just my point.

3603. Awfully near it, is it not?—It is near, but——

3604. Very, very near?—But you have got in September of 1899, 3·3. That is in the particular September that those farmers' samples referred to the retailer's fat proportion was 3·3. Of course, they are not the same yields of milk.

3605. Nor the same year?—The same year, but not the same yield.

3606. Taken the same year?—Yes.

3607. They may not be the same farms?—That is so.

3608. Therefore there can be no comparison, I take it. Now what authority have you for saying that the milk is mixed before it is taken round to the shops?—I know that is the custom.

3609. Have the wholesale dealers means of mixing, I do not know how many churns? We have had people here, including Mr. Kennedy, who gave evidence the other day, and said it was the practice of wholesale traders to deliver the milk at the shops as they received it from the station, and that it was not mixed milk in any way, but that it was taken out of a churn or a barrel, or whatever it might be, and delivered to the shops?—Yes, I think that is the case. Where the milk can be delivered by cart it is delivered to the retailers' shops.

3610. I am speaking now of railway milk also; do you suggest that the railway milk is all taken home by the wholesale firms, and then there mixed, and then taken out again to the retailers?—Not all of it. The custom is very much like this. If the retailer gets a supply in the morning from one farm, as may quite well happen, that may be taken in by a cart; then half an hour or an hour after that, the retailer may have a supply from another farm sent either by cart or by rail, and the yields of those two farms are mixed.

3611. In those two cases you think the milk would be mixed before they sold it?—It is mixed, as a matter of fact; I know it is.

3612. You do not suggest that the wholesale traders take it home to their places, and then mix it, and then deliver a uniform sample to the shops?—Well, so far as one can state an impression, that undoubtedly is the impression.

3613. But you have no knowledge of it?—I do not know that it is in common use anywhere else than in Glasgow, *Dr A. K. Chalmers.*

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but the milk people there speak of what they call tusking the milk.

3614. (*Mr. Cowan.*) It has the same meaning as blending?—It is that in fact, but I do not know the origin of it. It means mixing the milk. I should say that it is an extremely rare thing for any consumer in Glasgow, unless he arranges definitely that he will have one firm's milk, to get it.

3615. (*Mr. Barham.*) You do not suggest any doubt about the accuracy of what Mr. Kennedy said with regard to the practice of the wholesale trade?—I do not know what he has said.

3616. I thought I had told you that it was not the custom to mix the milk at all, but to deliver it in the churns that it arrived in at the stations?—To take it to the retailer's shop?

3617. That is the case?—But it is mixed after it gets to the shop.

3618. That is the case; you do not doubt that?—He is stating the fact there in so far as it applies to the milk before it reaches the retailers' shops.

3619. What you mean is, supposing the retailer draws his supply from two or three different people, he takes care to mix his milks together before sending them out?—That is the practice.

3620. But if he draws his supplies from one person of course that does not apply?—I think most of the retailers draw from more than one farm.

3621. (*Mr. Murphy.*) With reference to your first Table, and the four milks that were all of a somewhat low standard in regard to the fat, I see that in your fourth column you have the word "Doubtful" against one of them?—That is so; that is the analyst's observation.

3622. Would you be prepared to say in the case of the other three that Mr. Barham referred to, the farmer could not have done a good deal better with regard to the quality of his milk if he felt any necessity for it?—I think it is quite likely; I think it is within the range of the farmer's power.

3623. So that the fact of those four milks occurring in that list does not weaken your view that the standard you have suggested might be maintained?—I do not think it invalidates it at all on the question of the standard being raised.

3624. Then as to Table B, Mr. Barham has called attention to certain samples of milk which had rather a low quantity of fat?—Yes, there was one in February, I think, of 2·9.

3625. That was so?—And one in August of 2·8.

3626. Because you have eliminated from that table milks that were recognised to be adulterated you are not, I understand, suggesting that these other milks may not have been tampered with to some extent?—No.

3627. So that to base a standard upon or to be guided to a standard by milks which may have been tampered with somewhat would hardly be fair?—No. The details in Table A show that there are just 14 per cent. of the milks which present the same volume of fat that the farmers' milk does; those are taken between the time the milk leaves the farmer and reaches the consumer.

3628. And the September milks may be looked upon as a rough average of the year?—I think they may be reasonably taken so.

3629. Then you have suggested that there might be a standard for the winter months different from that for the rest of the year?—That is because in reading one sees constant references to the richer milk which is obtained in winter from the animals.

3630. I want to ask you as a medical man—assuming it to be practicable to require a larger amount of fat in the winter months—whether that would be valuable from a health point of view?—I think the presence of fat undoubtedly—in winter particularly—would be a useful thing.

3631. That is what I wanted to ask you; a larger amount of fat is particularly important in the winter months, as the natural tendency in cold weather is to have recourse to fatty foods, so that even if there were a little inconvenience in having two standards it would be fully compensated by the advantage to the public?—By the advantage to the consumer undoubtedly.

3632. (*Chairman.*) You do not give us any analyses of the milk obtained from the stall-fed cows of the City, do you?—Several of those in that 280 would be stall-fed animals.

3633. But they are not separated?—No.

3634. Your idea is that they give poorer milk than what is produced in the outside country districts?—That is so.

3635. You believe so, but you do not know?—I do not know it as a matter of knowledge.

3636. You think, as far as you are able to judge, that the milk supplied to Glasgow by the farmers is on the whole really genuine and good milk?—It think it is a genuine, and it certainly is a good milk.

3637. And you wish us to infer that when it gets into the hands of the retailers it is liable to a certain amount of adulteration?—The fat disappears to a certain extent.

3638. Of course, as Mr. Barham very truly says, it is rather difficult to compare the milk obtained from the farmers in September with the milk sold by the retailers during the rest of the year?—Yes, that is quite true, but before accepting this as a fair standard for comparison I had contrasted it with the average composition of the milk of Ayrshire cattle as published by reliable observers.

3639. Perhaps I might call your attention to the Table where the farmers and retailers are compared; does that give an accurate list of all the prosecutions that have taken place?—Yes. (*See Appendix XII.*)

3640. All?—This list includes all the prosecutions from January, 1897.

3641. And there, apparently, there is only a small amount of adulteration carried on by the farmers, and a very considerable amount of adulteration carried on by the retailers?—The numbers prosecuted, accurately stated, I think, are 21 farmers and 53 retailers.

3642. And as far as I am able to judge from these figures the amount of fraud, as we may call it, on the part of the farmers is very much smaller than it is on the part of the retailers. I find four cases among the farmers as low as 3 and 4 per cent. of added water, which as far as one can tell, might really not have been added—it might have been naturally in the milk. Take August; in that month there is one case among the farmers showing as much as 3·28 of fat and 8·15 of solids not fat, and the remark is "4 per cent. added water"?—Yes.

3643. Now I should like to know whether a conviction was obtained on such a narrow margin as that?—The prosecution was raised.

3644. Did any conclusion follow?—I am afraid I cannot tell you that at the moment.

3645. The next one shows 5 per cent. of added water?—Just the same observation I have to make here.

3646. Then lower down, in December, 1898, there is only 3 per cent. of added water and again in March, 1899, 4 per cent.?—Yes. I noted only the cases where the prosecutions had been raised.

3647. And you cannot carry it any further?—Not at the moment.

3648. From your point of view as a medical officer of health, would you say that those particular four milks were injurious to health or were really not genuine?—They would certainly not be injurious to health in the respect that the fats were in poor quantity; the injury to health would be little compared with where the fat is reduced, such as you have it in the retailer's milk.

3649. Do you think those would be fair cases for prosecution?—They are very near the margin, certainly. There may have been some particular circumstances pointing to the wisdom of prosecution there that are outside of my knowledge at the moment.

3650. At all events as far as you are able to judge you think that the standard you recommend for milk would be perfectly easily reached by the producers of milk?—I think there is no question of that.

3651. There is one other point, I think, which is raised by the question of your skimmed milk; I want to be quite sure what you would recommend on that point. So far as I understand you, you would grade the milk—that is, you would say: Let there be a standard for whole milk recognised as the ordinary milk of commerce, then that there should be another class called skimmed milk, which should contain a certain proportion of fat which should be defined?—Yes. The use of skimmed milk is pretty common in Scotland.

3652. I understand that is so; and therefore you recom-

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mend that there should be a recognised article of commerce called skimmed milk, and that it should contain a certain proportion of fat?—That is so—that it should be impossible to sell separated milk to a man who asks for skimmed milk.

3653. Because you say the skimmed milk is wholesome for children and the separated milk is not?—Because of the fat the skimmed milk contains.

3654. Do you mean to say that 0·8 of fat in milk is beneficial to a child?—0·8 is the minimum, but the average proportion seems to be over 1 per cent.

3655. Is it good for a child to have milk given to it containing only 0·8 per cent. of fat?—Obviously when there is more fat or cream present it is better; but there is still the difference between that and a smaller proportion.

3656. I can understand that, but is it worth while to make this definition on the ground of the benefit to health?—There is one incidental fact which I learnt quite recently. It is the custom in many parts of the country, I understand in Scotland, to feed pigs on skimmed milk. Since creameries have been established they have fed them on separated milk, and I believe that a very obvious difference in the fat of the pig and in the general condition of the health of the animal has followed. Comparing a pig fed on separated milk with one fed on ordinary skimmed milk it suffers in health.

3657. The question is not so much the health of the pigs as the health of the children of Glasgow?—I think that may be taken as somewhat indicating that even the small difference of probably 0·5 per cent. of fat does affect the health of the animal, when its food is very largely skimmed or separated milk.

3658. I believe you have had some representations made to you from the co-operative societies in Glasgow, have you not?—Yesterday, I had an interview with some gentlemen representing the Glasgow co-operative societies. Might I read a letter which they gave me, because it details the action that they would like to take?

3659. We should be glad to hear what you have to say from Glasgow on this point?—This is a letter addressed to the secretary of the Scottish Section of the Co-operative Union, which I believe is simply one section of a union including the co-operative societies all over the kingdom. It proceeds to say: "A meeting of the dairy committees of the city societies was held on Saturday last," that is last Saturday.

3660. Do you put this letter in?—It is entirely at your discretion, it indicates the position of the co-operative societies: "A meeting of the dairy committees of the city societies was held on Saturday last for the purpose of considering the advisability of making representations to the Board of Agriculture, who are presently dealing with the subject, in favour of fixing a three per cent. standard for milk. The meeting unanimously agreed that not less than 3 per cent. should be fixed as a standard for milk, and that joint action should be taken in making representations to the Board of Agriculture in favour of that standard. As the standard proposed to be fixed is to be applicable to the whole of Scotland, the meeting considered it would be well if any representations made could be made in the name of the co-operative societies in Scotland dealing in milk, and I was accordingly instructed to write you on the subject with the view of the section taking action in this matter. I shall be glad to learn if possible by Saturday if your section will take up the subject for the immediate consideration of the Scottish societies."

3661. Do the Co-operative Union ask you to bring this matter forward?—They asked me what use I could make of the knowledge they gave me of their position, and of their desire to have the standard raised, and they explained that whereas it is their custom to sell the milk as it comes from the farmer, they know that certain milk dealers do not follow that custom and are advocating a lower standard. I rather think that the retailers in some way, or the milk dealers, purpose suggesting 2·75, and this meeting of the Co-operative Union is in order to make a counter-proposal.

3662. Are they in a large way of business there? Do they dispose of a large quantity of milk?—I have a list which is imperfectly filled up, but it contains the names of five societies who altogether have sixty dairies among them. There are three smaller societies which they expect will join them at a meeting to-morrow.

3663. They are apparently not afraid of 3 per cent. of fat as a standard?—They are not afraid of 3 per cent. Their statement is that they are injured in their business because of milk of a lower standard being procurable.

3664. (*Mr. Barham.*) They do not suggest 3·25 at any part of the year?—No, not at any part of the year.

3665. (*Mr. Murphy.*) On the question of the standard of skimmed milk I understood you to say that by skimming the amount of fat could be reduced to 0·8 per cent?—I believe that is so.

3666. But in making that statement I do not understand you to suggest that that should be the standard if a standard were fixed for skimmed milk?—No, I understand that you cannot reduce the fat in skimmed milk below that, because the time necessary for further reducing it would make the milk sour; but that you can reduce it by the separator much below that.

3667. But if the skimmed milk were going to be recognised and sold by a particular standard, I understood you would have a larger amount of fat fixed?—I think chemists take one per cent. as representing on an average the proportion of fat that is present. But the proportion of fat present in those skimmed milks which we reckon in Glasgow as genuine is 1·43.

3668. (*Chairman.*) I did not gather that was the standard you yourself represented?—I had not thought so much of the question in the light of a standard as in the light of a commercial distinction; but I am afraid that goes back to the question of a standard after all.

3669. It does; you bring it forward more as a matter of the health of the people than from any other point of view?—Yes.

3670. You say in consequence of the manner in which skimmed milk is sold now a very inferior article is supplied, and the children of the town suffer?—Yes.

3671. Therefore, you think a standard should be fixed?—It practically comes to a standard for skimmed milk.

3672. It comes to that, and, therefore, we say what do you suggest yourself as a minimum limit—as a safe standard?—I do not know but that one per cent. would represent fairly the average proportion of fat that is present.

3673. Would you be satisfied if the city of Glasgow managed to get skimmed milk of that sort if they asked for it?—I think that practically more nearly represents what the people understand by skimmed milk—that it has some fat, probably not much, but some; yet much more than the separated milk has.

3674. You would be satisfied if that is fixed as a standard?—Yes, I think it fairly represents the demand.

3675. (*Professor Thorpe.*) I should like, if I may, without taking up an undue amount of time about this question—as, of course, this is a practical question to be dealt with in a practical way—how is a man vending skimmed milk to be assured that he is reaching a limit; how is he to know that he is reaching even the limit of one per cent.? Skimming milk is a mechanical operation which depends very largely upon the skill of the dairymaid, upon the length of time the milk has stood, and upon many conditions of that kind, such as the temperature, the season of the year; it may be affected by fifty things?—That is so.

3676. Anybody may, in good faith, skim the milk, but what guarantee can they get that they have left in as traders such an amount of fat as you would fix upon as a standard?—There is just the guarantee of experience. That is a very crude way of getting to any standard.

3677. It varies with the months of the year, it varies with the character of the milk, it varies with the conditions under which it has been allowed to stand, it varies with fifty things?—That is perfectly true, but it does not seem to be capable of variation below a certain quantity. It is the introduction of separated milk which practically takes your cream and your fat entirely out; however little the difference is it is still there.

3678. Are you aware that it is quite possible by hand-skimming to reduce the amount of fat in milk to as low

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a point as any machine will do it?—Under ordinary conditions of temperature?

3679. Under conditions which can be easily secured?—I did not know that; I thought that under ordinary conditions of skimming it went wrong before you could get below 0·8.

3680. If you say that milk shall not be sold with less than a certain quantity of fat, whether it be machine-skimmed or hand-skimmed, that is a tenable position; but it is very difficult to work any suggestion as a practical matter which is dependent upon such a variable and fluctuating condition of things?—Unless by prohibiting the sale of separated milk as skimmed milk.

3681. You cannot prohibit the sale of separated milk nowadays; however, that is a matter of opinion. I should like, if I may, to ask you one further question: Has it come within your knowledge as medical officer of health that imported condensed skimmed milk is at all used to "thin down," as it is called, ordinary milk; when there is a shortage of milk is any large quantity of condensed milk used?—No, I have no knowledge of that.

3682. Is it within your knowledge that the stall-fed beasts that you made reference to are very largely fed upon brewers' grains and distillers' refuse?—I believe that is the case very largely.

3683. Do you imagine that it is for that reason that they give relatively so poor a quality of milk?—Yes, I think it is given with the distinct intention of raising the quantity of milk that is produced.

3684. (*Dr. Voelcker.*) I am afraid Professor Thorpe's remark may give rise to some misapprehension; what I should like to put to the witness therefore is this: Is it not the case that milk which is separated by hand, by the ordinary way in which it is done on a farm, will never come as low in fat as machine-separated milk is able to come?—My impression was that it never could.

3685. (*Professor Thorpe.*) You mean as done on a farm?—Yes.

3686. (*Dr. Voelcker.*) That is hand-skimmed milk, as it would come into commerce?—Yes, as it is usually done.

3687. And therefore it would not be in your opinion an impossiblity, or even an inconvenience that a milk which was hand-skimmed on a farm and sold as hand-skimmed milk should be so described?—I think not. I rather think that any variation would have the effect of leaving more fat than usual in it.

3688. That milk so sold and coming into commerce would as a matter of fact contain a very much larger amount of fat than milk which had gone through the separator?—Yes.

3689. Do you know that people in the country draw a distinction between separated milk and hand-skimmed milk, because they know both for their own feeding and for the feeding of their calves, as well as of the pigs, that have been mentioned that hand-skimmed milk, because it has got more fat, is better?—The people in the country know that?

3690. Yes?—I did not know that they did, but the experience in the piggeries seems to be quite well known.

3691. (*Chairman.*) What applies to pigs would apply as you say also to human beings?—Yes.

3692. (*Dr. Voelcker.*) When you spoke of the explanation of the farmer with regard to the feeding of his cows which give rather a low quality, you did not speak from any personal knowledge yourself?—That was taken entirely from the letter of the officer of health.

3693. We had it in evidence yesterday from Mr. Speir, who has made extensive experiments on this question, that the influence of the food is not as marked as was supposed?—I know that is the result of his investigations.

3694. Then when the farmer suggested that a particular feeding of his cow was the cause of the milk being of rather a low quality he was speaking more from general presumption than from actually being able to prove that that was the case?—I quite took it that that was the explanation.

3695. The last question I put to you is one raised by his lordship. In reference to the cases on the border line where you are not certain that a prosecution did ensue—where the figures of fat and solids not fat came very near the border line—you could not say that in any of those cases the presumption of adulteration having taken place may not have depended on other points besides the mere matter of fat and the solids not fat; the analyst (for instance) may have considered the amount of nitrogen that that milk produced or the amount of ash that it produced, and decided on that for all you are aware?—That is possible; the prosecutions, of course, were raised on the certificates as stated, and these figures are taken from them.

3696. I mean the analyst may have taken other points into consideration which are not obvious on the face of this table?—And there may further have been suspicious circumstances regarding the milk on previous occasions which led to the sample being taken.

3697. (*Mr. Cowan.*) You have stated in your *précis*, and also in answer to Mr. Barham, that cows are seldom kept in a herd over eight years?—I am informed that is the case.

3698. What I would wish to know is, do you mean that the cows are disposed of at eight years of age, or after giving milk for eight years, which would make the cows full aged—10 or 11 years?—I understand it to mean eight years of age.

3699. You did not mean after eight years' milking?—No, it was after eight years of age.

3700. I am afraid there are very few cows go out of stock at eight years of age, but of course if you allow after eight years of milking there would be a difference?—That was my information when I made the inquiry.

3701. After eight years of milking it would make a difference of three years?—It would. My impression was that it was eight years of age.

3702. You are not quite certain?—I am not cretain; it is information with regard to which I have no personal knowledge.

3703. (*Mr. Barham.*) When you gave that evidence you really do not know what would be—what shall we say?—the prime life or the chief period of lactation of a cow?—I have no personal knowledge of that matter.

3704. So the evidence you gave was given on no personal knowledge?—In so far as it affects the age of the cow.

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Mr. Walter William Fisher, called; and Examined.

3706. (*Professor Thorpe.*) You are President of the Society of Public Analysts?—Yes.

3707. You are a Master of Arts of Oxford?—Yes.

3708. You are Aldrichian Demonstrator of Chemistry in the University?—Yes.

3709. And you are a Fellow of the Institute of Chemistry?—Yes.

3710. You hold the appointment of Public Analyst for the County and City of Oxford and the Borough of Banbury, as well as for the counties of Berks and Bucks?—Yes.

3711. You are also District Agricultural Analyst for Oxfordshire?—Yes.

3712. You have been desired by the Council of the Society of Public Analysts to give evidence on the subject of milk standards?—I have.

3713. This subject of milk standards has, I understand, engaged the attention of your society for some time past?—Yes.

3714. Would you kindly tell the Committee exactly how it is that you have arrived at your present limits of 3 per cent. of fat and 11·5 per cent. of total solids; I mean, how the Society, as a Society, has arrived at them?—The Society held an investigation in the first instance to examine a method for determining the proportion of fat in milks, which was proposed as a new method by Dr. Adams, of Maidstone. A committee was appointed to try his method, and gather a number of results, and then compare those results. After two years' work that committee reported to the Society that the method was a satisfactory one, and that it practically gave results which were alike in the hands of different persons using it, and they recommended the adoption of the method. But owing to the circumstance that this method really was more accurate than the method which the Society had previously used, that is to say, got out more fat than the old method did,

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it became necessary to revise the limit for the fat in milks and the Committee recommended on that account that the lowest limit of fat should be fixed at 3 per cent. They presented their report in November, 1885, and in March, 1886, the Society received the report, and adopted it, and recommended the method for use. That, I think, is a history of how that came to be. I may say that I myself was not a member of the Society until March, 1886; I was actually elected at the meeting at which this passed.

3715. As you now officially represent the Society, if you could tell us rather more in detail how the present limit was arrived at, I think it would be very useful to get it?—Do you mean how the figure was fixed?

3716. I will explain myself. I gather from what you have said that the effect of the investigation of the Adams' process was to show that the amount of fat which had hitherto been extracted from the total solids was too low?—Yes.

3717. That the Adams' process extracted a larger proportion of fat than had hitherto been extracted by what I presume was the Wanklyn process?—Yes.

3718. Therefore what you really did was to take (you will correct me if I am wrong) the figures representing the composition of milk, and somewhat rearrange those figures, taking away from the solids not fat a certain amount, and adding that on to the fat?—Precisely; the two things are co-relative.

3719. Therefore your limit of 3 and 8·5 was not arrived at by any independent investigation of the nature of milk; these particular standards were obtained by modifying pre-existing limits?—It was an investigation upon milk in the sense that they analysed a number of milks to see what results would be obtained by this method.

3720. But primarily the investigation was an investigation upon the character of a method?—Primarily that was so.

3721. It was not an investigation on the composition of milk?—It was not so intended, except collaterally to enable the members of the Society to judge whether the milk was genuine or not. That was their object. It was collaterally an investigation on milk—but I do not quite know what is in your mind.

3722. Comparatively few analyses would serve to determine the validity of the method?—Perfectly.

3723. Therefore all that you were immediately concerned with as a Society—or rather as a Committee—was to determine the validity of the method?—Yes, that is undoubtedly true. But the committee had the responsibility of recommending standards to the Society, and they did more than determine the mere correctness of the method of analysis. The committee of that day revised their own ideas as to what the standard of milk should be, and recommended the Society to adopt these new limits.

3724. What they did was to take over existing analyses, and practically re-arrange the factors from those in the light of the investigation of the Adams' process?—I cannot say whether they did or they did not.

3725. You do not know?—No; I cannot tell you. I will tell you who can inform you, that is Mr. Hehner. Dr. Adams was a member of the committee also. I believe they are all living, I am happy to say.

3726. Is the Adams' process now generally adopted by public analysts?—I think not. I think most public analysts only resort to it very exceptionally.

3727. Why do they not continue to use it?—I believe that the reason is that you can get at a result practically as accurate with less labour.

3728. What is the position of the Society of Public Analysts, then, towards their so-called official method; have they withdrawn it as an official method?—No, not in the slightest.

3729. Have they recognised these other methods officially?—Never.

3730. Then what is the position?—They have taken absolutely no action in the matter as a Society, and each individual member of the Society, as far as my own knowledge goes, determines the fat in the way that he thinks best.

3731. Then there is no official method?—Yes. The only official method is one which is recognised, and has never been——

3732. It is not adopted?—It was adopted for a time.

3733. But is not now used?—I think it is not much used as far as I know. (*See further evidence* p. 286.)

3734. (*Chairman.*) I am anxious to know if that is the case. We have heard so much of the different methods of arriving at a conclusion on a sample of milk. Can you tell me what is the general practice of public analysts throughout the country now; what method they adopt?—In the case of milks which are of a very good quality, I believe most persons calculate the fat without determining it at all. Some I know determine it by one of the centrifugal machines, such as the Gerber, and from that they calculate other things, taking the specific gravity and the fat. But in the case of doubtful samples, which have to come into court, or upon which prosecutions are likely to arise, I think most men depend either upon the Werner-Schmidt, or the Adams method. The Werner-Schmidt is an ether process.

3735. (*Professor Thorpe.*) I think, if you do not mind, you might describe it in detail. We have not really had these methods upon our notes, and we rather look to you as the president of the Society of Public Analysts, to go into these little details for us. Would you kindly explain to us what the Werner-Schmidt process is?—Yes. In the Werner-Schmidt process of estimating the fat of milks a measured quantity of milk is put into a tube, which has graduations upon it. A measured quantity of ordinary concentrated hydrochloric acid is added to the milk, and then it is boiled in the tube until a complete solution of the curd seems to be effected. It is then allowed to cool, and when it is cold it is filled up nearly to the top of the graduations with ether, corked, and shaken. The ether dissolves the fat out of the milk, and soon separates in a clear condition at the top, and the acid liquid remains at the bottom. There is a very small line of demarcation between the two where some matter which is not soluble in ether or in the liquid below will collect—a little fluffy material collects there. When the separation of the ether is complete a measured volume of the ether is withdrawn by a pipette, and delivered into a flask which is previously weighed so as to have its tare ascertained; that flask is afterwards cleared of ether, first of all by being placed in warm water to distil away the ether—which can be collected by a condensing arrangement—and then the flask is placed in a water oven to dry it thoroughly; and finally the flask with fat is weighed. That gives you the weight of fat in a portion of the ether. The remainder of the ether left in the tube is estimated by reading the graduations on the tube, and a correction is made by adding an aliquot part of the weighed part for the quantity of ether left in the tube so as to include the whole of the fat in the estimation. I hope I have made that clear—a portion is weighed and the aliquot part is estimated by volume; a correction is then made for that additional volume which is added on to the original weight, and that gives you the total weight of the fat in the milk.

3736. Would you kindly explain to the Committee now how the other factors are determined?—The other factors in milk?

3737. Yes?—I might first explain one point about this Werner-Schmidt process. What you get as fat is not absolutely pure fat, and you do not extract entirely from the watery liquid the fat which was originally present; but it seems somehow as though these two results—the deficiency in the one case and the excess, perhaps a little caramel, in the other—counterbalance each other, and the actual result is really very near the truth; it comes very close to the calculated quantity of fat, calculated from Richmond's formula, as it is called. I do not know whether the Committee know about that.

3738. No, we have had none of these details before us yet?—It comes very near the quantity of fat which has been calculated by a formula, and it also comes very near the quantity of fat which can be got by the Adams' method.

3739. Do you say the Werner-Schmidt process is very generally used?—I think so; but really I have no right to say that I know much about that, because I have only been to a few of my friends' laboratories. As far as my own knowledge goes I think it is the one commonly used.

3740. Do you yourself use it?—Yes, I use it for almost all cases. Do you wish to have the method for the determination of the total solids?

3741. Yes, I wish to have the other point?—For the determination of the total solids the custom is to measure 5 cubic centimetres of milk in a porcelain dish with a flat bottom so that it spreads out in a thin film, and to dry that on the surface of a water bath, and finally to put it into a water oven. It is weighed

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from time to time, and when the weight is fairly constant and does not differ more than a milligramme or two, it is assumed to be dry. Those two methods give you the fat and the total solids. The solids not fat, that is the rest of the solid ingredients of the milk, are estimated by difference; they are not estimated directly by public analysts as a rule.

3742. That is to say you merely subtract one from the other?—Yes, you merely subtract the fat from the total solids, and the solids not fat are the figure that you get in most cases. Of course, it is possible to determine the sugar, and it is possible to determine the proteids, that is to say, to determine the nitrogen, and to get the proteids from the nitrogen. If you want to determine the nitrogen the usual plan nowadays is to determine the nitrogen by Kjeldahl's method, which, of course, is well known; but those determinations do not give you as accurate a knowledge of the non-fatty solids as the others do. The fat and the total solids are capable of very fairly exact determination.

3743. Is there any other process in general use among analysts?—I am not aware that there is any other in general use.

3744. Now, perhaps you had better explain to the Committee the method of calculation which you have just referred to?—I am sorry I did not bring it with me. Some few years ago a paper was published in the "Analyst" on the way to calculate the fat in milks, and a number of analyses were made of milks of various grades of quality—milks which contained water and so on—and from the general results of these analyses, taking the specific gravity the total solids and the fat, a formula was deduced by which, knowing the specific gravity of the total solids, you can calculate the fat. On the basis of that formula tables were drawn up which give you the fat in milk for a large number of cases of specific gravity and total solids, and also, as the formula is one which is very nearly a straight line, it is possible to make a rule to give the figures; a slide rule has been constructed, and with one of these slide rules you can, when you have got your solids and specific gravity, shift the slide along, and you find the fat at once indicated on the slide rule. Perhaps Professor Thorpe has seen one?

3745. Yes, I have seen many of them?—I should be very happy to show it to the Committee, but as mine is at Oxford just now I cannot do so I am afraid.

3746. Is it within your knowledge that cases are brought into court on this method of the slide rule?—I do not know that. I should never venture to take a case into court on the slide rule. The slide rule is simply to give an indication of where the fat ought to come. I never take a case into court until I have determined the amount of fat certainly twice if not three times by duplicate analyses. I never take a case into court on a single analysis.

3747. What we should like to gather from you in your capacity as president of the Society of Public Analysts is what are the methods which are actually used by public analysts when prosecutions are instituted?—I can only tell you myself what I do.

3748. You use, you tell us, the Werner-Schmidt method very largely?—I use the Werner-Schmidt method; I have a Gerber machine which I also use, but I think the Werner-Schmidt is the most accurate method that I use for arriving at the quantity of fat in a milk. I may perhaps venture to say, as a matter of fact, that the last certificate of mine which was disputed, and which was fought out in court was in a case of skimming which had been referred to Somerset House, and that the percentage of reduction of fat in my certificate was exactly the same as the percentage of reduction arrived at by the Somerset House authorities—I mean the Government Laboratory—which shows, of course, that it is possible for persons working independently to arrive at the same conclusion.

3749. Now, in view of this Committee, your society, I gather has had several meetings with the object of determining what their action should be in recommending to the Committee what the limits or standards should be?—Yes, we had two meetings of the council to talk this matter over. The only real difference of opinion between us was as to whether it was possible to raise the limit of fat above 3 per cent. There were some members of the society who thought it might fairly be raised; 3·5 was suggested, 3·25, and 3·2; but after a prolonged discussion we came to the conclusion that it did not seem safe for us to raise our limit beyond its present value for fear of condemning milks which are just above the border line. That was the thing which weighed with us most.

3750. You do not condemn them, you merely raise the presumption which has to be cleared away?—We did not quite know what "raising a presumption" might be intended to mean. When a sample of milk comes to a public analyst he is asked to say whether that milk is genuine milk, or whether it contains any foreign ingredients, or in the case of skimmed milk whether any cream or fat has been abstracted; and he has to give a definite opinion on those points on his certificate. If he simply says, "I presume that this is probably skimmed," or "In my opinion this probably contains 10 per cent. of added water," I think his certificate would be almost without value.

3751. Surely the terminology of the section may allow of some modification in the wording of the certificate?—It does not seem to me under the Act that there is any room for a Scotch verdict; it must be "Guilty" or "Not guilty"; I do not think the Act contemplates "Not proven."

3752. May I point out that the verdict does not rest with you—the verdict rests with the bench?—May I point out to you that the analyst is, as it were, a court of First Instance; the analyst has to make up his mind whether the sample is genuine or not?

3753. May I point out to you that the analyst has to make up his mind whether a presumption may be raised in terms of some regulation which it is now the business of the Board of Agriculture to draw up?—Very good; if that is the case, the analyst can do it; but I have not read it in that way.

3754. Is that not the fact? May I draw your attention to Section 4: "The Board of Agriculture may, after such inquiry as they deem necessary, make regulations for determining what deficiency in any of the normal constituents of genuine milk, cream, butter, or cheese, or what addition of extraneous matter or proportion of water in any sample of milk (including condensed milk), cream, butter, or cheese, shall for the purposes of the Sale of Food and Drugs Acts raise a presumption, until the contrary is proved, that the milk, cream, butter, or cheese is not genuine, or is injurious to health, and an analyst shall have regard to such regulations in certifying the result of an analysis under those Acts"?—Yes, perfectly; but supposing the Board makes a regulation that 3·2 shall be the limit of fat in milk, then if I get a milk which contains less than 3·2 it will be my duty to say "This milk is deficient in fat."

3755. Quite so—in terms of the regulation?—Yes, as I do now. The phrase I use is something like this: "I am of opinion that this milk is deficient in fat to the extent of 16 per cent. below the natural quantity. This opinion is based upon the fact that the milk only contains such and such a percentage of fat, whereas in genuine milks the percentage should not fall below 3 per cent." That is the formula which I use now; I state my standard on the certificate. I should simply alter 3 to 3·2, of course, if the regulation were made so.

3756. Who has prescribed your formula?—The formula was arrived at in this way: There was a prosecution for adulterated milk, in which the analyst stated on the certificate, "I am of opinion that this milk contains 6 per cent. of added water"—I am not sure whether that is the exact figure, but 6 will do—and it was held by the High Court under Mr. Justice Hawkins and some other judges—Fortune *v.* Hansom, I think, was the name of the case—that this was an insufficient certificate, and that it was the duty of the analyst to set forth the constituents of the sample of milk, to state the percentages, and the judge went so far as to say the percentage of water. When that decision was made we began to state the percentage composition of milk in our certificates, and every prosecution failed by putting in the percentage of water. I will show you why. You say a milk contains 12½ per cent. of total solids, and it contains 87½ per cent. of water by difference; another milk contains 11½ per cent. of total solids, and contains 88½ per cent. of water by difference. When those figures are before the bench the solicitor for the defence says, "How much water should a genuine milk contain?" You say "87½ per cent. may be taken as an average figure." Then he asks, "How much water did this milk contain?" You say, "It contained 88½." "Well, with 1 per cent. of water dilution how can you say it contains 10 per cent. of added water?" That has happened over and over again. Being taught by this experience we had to devise another method for drawing up our certificate; and so now the custom is to state that the sample contains such and such a percentage of fat, whereas the fat should not fall below such and such a percentage; or, it contains such and such a percentage of non-fatty solids, whereas the non-fatty solids should not fall below 8·5 per cent. That certificate has stood the test of a High Court appeal, and one of the Judges who passed that certificate was one of the Judges with Mr. Justice Hawkins in the other case; so that it is now an established formula which we feel that we can use safely.

3757. There is nothing to prevent you now in terms of the amended law giving your certificate in such terminology as is implicitly prescribed by Section 4. If the Board of Agriculture after the findings of this Committee prescribe these limits, you will have merely to state the numeral results of your own analysis, and to show how, on the basis of those limits so prescribed by the Board of Agriculture, if they do see fit to prescribe them, there is a presumption first that the milk is not genuine; and on the basis of the numbers which will be given to you, you can calculate the degree of impoverishment or the deficiency?—The form of certificate says: "I am of opinion this is a sample of genuine milk"; below that the other words are: "I am of opinion the sample contained the parts as under, or the percentage of foreign ingredients as under." Supposing I state that in a certificate in the form suggested, of course I should have to calculate the amount of deficiency on the standard whatever was adopted, and then it would rest with the local authority to whom that certificate goes to order a prosecution or not to order a prosecution. That is clear enough.

3758. That is exactly what I am driving at. All you do in the first instance is to tell the local authority that you have found such and such analytical results. They see how far they differ from the limits laid down, and they act accordingly?—Yes. They sometimes ask me if they shall prosecute.

3759. That is their affair whether they ask you if they shall prosecute; that is not incumbent on them?—No, they do not always take my advice.

3760. I gather that your society has deliberately arrived at the conclusion, as the result of these two meetings of the Council, that their present limits of 3 per cent. of fat and 8·5 per cent. of non-fatty solids should still hold good?—We have been unable to see that we would be justified in raising them.

3761. Would you mind telling the Committee what arguments were offered on the part of those gentlemen who desired to see the limit of fat raised?—It was pointed out that the average amount of fat in milk was very considerably over the minimum limit which the society held.

3762. You mean the limit of 3 per cent.?—Yes, the average amount of fat in milk is very considerably over 3 per cent. It was thought that as the society had maintained this 3 per cent. limit for some time in the face of considerable opposition, that now the opposition had disappeared, it was a favourable opportunity for going a little better and improving the quality of milk generally as supplied to the public. That was the principal argument of the members—that there was too large a division from the average amount of fat in milk to the minimum, and that the line could be drawn nearer the average without unjustly excluding milks which might have to be passed as genuine. That was the feeling that members had, I think. On the other hand it was pointed out that the present standard of 3 per cent. of fat had resulted in a state of things under which by far the greater proportion of the milks which come into the hands of public analysts are passed without question—their genuineness is not questioned, and no presumption is raised that they are other than genuine milks. As far as we can make out that applies to three-quarters of the milks which come before us. Then the standard of 3 per cent. enables us to stop any very serious removal of fat from the milks if it is systematically carried out on a large scale. We cannot be certain that milks are never mixed with separated milk by adopting that standard of 3 per cent., but we feel pretty sure that most of the milk dealers do not tamper with their milks at all, and that we detect a certain number of those who remove too much fat. We feel also pretty sure there is a certain number who escape detection, but those men help to protect others who ought not to be prosecuted for being below the standard. That, I think, in a general way——

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3763. Is an outline of the arguments, *pro* and *con*, which were adduced at your Council meetings?—Yes, there is another matter which I ought to mention in this respect. Our standard which we have adopted has been applied to all milks analysed throughout the whole of the United Kingdom as far as it is officially done by public analysts. I do not know that every public analyst has adopted it, but as far as we know that standard of 3 per cent. has been applied to all milks, and it is a standard that has been applied at all times of the year irrespective of the natural variations which we know occur in the fat of milks. It was felt that if we raised the standard there might be times in which milks which are perfectly genuine would fall below the standard, and we should not have any very easy means of finding that out. I might point out to the Committee that it is difficult to get any analytical corroboration of the fact that fat has been abstracted. If you put water into a milk you could get analytical corroboration of that fact by investigating several of the constituents. If you merely deprive the milk of a portion of its fat it is difficult to get any analytical corroboration of that fact. You are obliged to base your opinion as to whether the fat is up to the natural amount or not by reference simply to the limit which is imposed by the society. That, of course, makes it rather more risky to fix a limit such as 3·2, if that were the limit suggested. Another thing that was pointed out was that milk varies in composition according as to whether it is morning's milk or afternoon's milk. Mr. Richmond's tables brought that out very clearly, and, of course, everybody knows that that is a fact, that when cows are milked at unequal intervals of eight hours, we will say, and sixteen hours between the two milkings, there is a variation in the quantity of fat in the two milkings. It was pointed out that this variation existed, and that the average milkings which were delivered to the Aylesbury Dairy Company in certain months contained only such and such proportions of fat. One I see in June, 1898, was 3·35, and that was an average, not a minimum. That being so, as it was the average of the produce, we felt it was rather risky to come very near that average figure in fixing our lower limit, and that there must be a certain amount of latitude. You have got some milks which contained more fat and some milks which contained less fat, and if you had gone up to 3·2 in the month of June, 1898, you would have come rather too near the average to be quite safe in your judgment. Then we also had regard to the fact that these particular milks were received by the company under a contract as to quality, and the farmers contract with the Aylesbury Dairy Company to supply milk containing—I believe this is right—3·25 per cent. of fat. That figure, I believe, was given in evidence before the Food Adulteration Products Committee by one of the farmers who supplied milk to the Company.

3764. 3·25 per cent. of fat all the year round?—Yes, that is their contract.

3765. All the year round?—I know no more than that; I cannot amplify it more than that; their contract is that. I know also, as a fact, that the farmers' milks do not always come up to this limit of 3·25, and that occasionally the supplies are rather below. When that is the case a letter has to be written to them, and that is adjusted between the Aylesbury Dairy Company and the farmer. But public analysts are not in that position. They cannot enter into a correspondence with the man who sold to the inspector the bottle of milk which comes before them. Therefore, the limit of public analysts must be placed at a lower figure than 3·25 per cent., which is the limit of a company buying milk under a guarantee.

3766. But I suppose a company can demand no more than the normal average condition of things, can they?—I am told that a man can improve the quality of his milk by giving the cows better food—that if he gets a letter from the dairy company in London saying that his milk is short of fat he has to exercise his wits in raising the quantity of fat to fulfil his contract.

3767. Is that doing anything more than weeding out one or two cows, or, it may be, half-a-dozen, who are giving milk of a poor quality?—I am not able to say how they do it. I have not the slightest information on

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that point. That is a matter of such technical detail in the treatment of cows that I have no real knowledge of it.

3768. Have you finished what you have to say as to the arguments?—I am trying to give them to you as well as I can. I am pointing out to you that 3·25 is a contract figure for the Aylesbury Dairy Company, and that it is not always reached by the farmers who send them their milks. I do not presume that their milks which contain a smaller quantity of fat have been tampered with. I presume in those cases that the deficiency is a natural deficiency. I noticed this remark in the "Analyst" three or four years back:—"It was in 1893 when Mr. Richmond in his annual account to the society said, 'In one case the mixed milk from a farm contained 2·99 per cent. of fat.' This shows the Society's limit for fat was well fixed." That remark was made in 1893, and I quote it to the Committee as being at the time made probably from a perfectly impartial point of view, and not prejudiced in any way by the proceedings which were taken later. Then I have had some knowledge myself occasionally of farmers in my district who have brought me milks to examine with a view of entering into a contract with London dairy companies. In some of those milks I have found that the quantity of fat was very slightly over 3 per cent. I have told the farmer that the fat was rather low, and that was the fact, that the milks which they brought me which they thought of sending to London to these dairy companies were just a little over 3 per cent. Therefore, it seems that the Society of Public Analysts in fixing a limit had to provide a limit which would apply for the whole year round, and not a variable limit from month to month which would apply to the whole of the United Kingdom—which would not rule out any particular breed of cows as far as we were aware, or bring milk under suspicion which might be drawn at different periods of lactation. We considered that from our point of view the only reasonable and safe course we could adopt was to maintain the old limit of 3 per cent. of fat. If the Board of Agriculture can get a sufficient amount of evidence to justify them in raising the portion to 3·2, I need only say we should not have the slightest objection to that being done from our point of view; it would only make it extremely desirable on our part for extra care in dealing with milks which approached that limit; indeed, even now, when a milk contains fat only slightly below 3 per cent. it becomes necessary for one to exercise caution in dealing with that case, and not to act on the analytical results rashly.

3769. May I ask how long you have been a public analyst?—Nineteen years—since 1881.

3770. Is it within your own knowledge and experience that the operation of the Food and Drugs Act has been to enhance the quality of milk supplied?—Yes, undoubtedly.

3771. How has that been brought about?—It has been brought about in this way—that the people who have sold milks which have been much watered or much skimmed have been prosecuted and fined. When I first became public analyst for the county of Oxford I used to get very few samples indeed, and the number has gone on gradually increasing—I have not any figures with me—until now they reached a respectable proportion for the whole county, a respectable proportion, I mean, as regards the population; no doubt the quantity of adulteration is very much smaller than it used to be when I first began to examine these things. I can give the Committee a case which occurred quite lately. In a town in Berkshire, three months ago, some samples of milk were taken by the inspector and sent to me for analysis; I reported against two of them and the sellers were prosecuted and fined. This week I have had five milks from the same town, the two men who were fined and prosecuted last quarter being among the five; and in both cases the total solids of their milk were over 13 per cent. this time. Now that is not a question of a 3 per cent. standard or an 8·5 standard, it is a question of being prosecuted or not prosecuted; and the decimal between 3·0 and 3·2 does not touch the quality of that milk. The milk that came to me yesterday was genuine milk.

3772. You have been a public analyst for nineteen years, is it your experience over that time that the general character of the milk supply which has come under your own observation has been very considerably improved?—Yes.

3773. Can you tell the Committee, however, whether, apart from any cessation of malpractices, there has been an improvement in the general character of the milk owing to the indirect operation of the Act?—I cannot answer that question apart from this—I know the proportion of adulteration has diminished, but I cannot answer the question as to whether the average quality of the milk has changed.

3774. Or improved?—Or improved—no, I cannot answer that. I should think that I used to get in the early days as good milks as I get now; but I cannot tell you how many of them there were per cent. which really regulates the question.

3775. Are you aware, for example, that certain cows which may have given large quantities of milk, but of poor quality, are now gradually being weeded out and replaced by cows which give rather a richer quality of milk, although, perhaps, not such free milkers?—Yes, I have a second-hand knowledge of that. Our friend the Dutch cow——

3776. Is gradually disappearing?—Yes.

3777. This standard which was fixed, you say, at 3 and 8·5 per cent., was practically fixed eighteen years ago?—In 1886.

3778. It has been adopted during the past fifteen years, I think you say, in your *précis*?—Yes.

3779. Inasmuch as we may gather, the general quality of the milk supply has been enhanced as regards its fat, is it not reasonable to expect that the limit as to fat may now be somewhat raised?—If it can be raised without injustice, I would unhesitatingly say raise it.

3780. Does not the Act provide for the possibility of the removal of the injustice?—The Act thought it did, but I have my doubts as to whether it does.

3781. Why have you doubts?—Because I do not see how this question is to be tried as to the presumption; I do not see how that is to be brought to an issue. It gives a man who is accused of skimming his milk an opportunity no doubt of having an appeal to the cow, as I might say; it gives him that opportunity, and that is very proper.

3782. That is what is contemplated, obviously?—Yes, but I do not wish to charge a man unjustly with skimming if I can at all avoid it.

3783. No one wants to do that, of course?—Precisely; that is the difficulty I am in. I have to say definitely whether a man has or has not committed an offence. I do not wish to make an offence against the man who is not guilty of it.

3784. It is not exactly in the nature of an offence; I think you are, perhaps, rather acting under a condition of things which has hitherto obtained; my point is that the condition of things is rather different under the new Act. I put this to you, whether under the new machinery the public has not a right to expect a more close approximation to the average condition of things than it had in times past?—I do not think it will make much difference. I think if you raise the fat from 3 to 3·2, it will magnify the amount of skimming—perhaps I should not say magnify—it will give a more accurate representation of the amount of skimming which the sample has undergone; but I do not think it will prevent people from skimming their milk if they wish to do it. You must remember that the number of cases where skimming is practised is comparatively small; most of these are dealt with by the 3 per cent. standard, and it is only the residue that you could hope to reach by a 3·2 standard.

3785. When you speak of skimming, I presume you also mean the direct addition of skimmed milk?—I use the word as synonymous with the addition of separated milk and mixing it together.

3786. You mean the abstraction of fat generally?—It results in the milk being short of fat. It is difficult to use one word for it.

3787. Of course, what I rather wish to point out to you is that the condition of things is a little different, is it not, from what it was twenty years ago, we will say before the age of separators?—Yes, true.

3788. In the early days this process of the abstraction of fat could not be carried on with impunity to the same extent as it now can be?—No, and there was not time for it.

3789. Therefore, I think you ought to have regard to that fact. The community was protected by the circumstance that it was not possible to allow large quantities of milk to accumulate so as to have their fat removed and skimmed milk to be added. That was not a condition of things which was workable then; but we are now face to face with a different condition of things. We live in an age when the separator is practically universal; therefore, there is a much greater chance of this abstraction of fat going on to a much greater extent than formerly. Therefore, by confining yourself to a limit of 3 per cent., the limit which the society fixed before the age of the separator—I put this to you asking for your opinion—you are rather devising means to make it easy for this system of abstraction of fat to be carried on on a larger scale than hitherto?—That would doubtless be the case if it were the fact, but then we do not find that it is the fact. We do not find that it is a fact that the separator, which has been used for so many years, is systematically used in the way suggested for reducing the strength of milks to 3·2 or anything like it. We find that a very small proportion of our milks come between 3 and 3·2.

3790. You heard the evidence of Dr. Chalmers, did you not?—I cannot charge my memory with having paid much attention to the figures.

3791. He pointed out to the Committee that the general form of adulteration practised by the retailers of Glasgow was abstraction of fat, which no doubt means the addition of separated milk?—Yes.

3792. Now, I put it to you whether by retaining your present limit of 3 per cent., a limit arived at eighteen years ago; now with the separator at every man's elbow, so to say, you are not rather encouraging the addition of a more or less quantity of separated milk in the new measure?—You say "encouraging."

3793. Do you think it encourages it?—You said "encouraging." I do not know that we may be said to encourage it; certainly our standard, it must be admitted, permits it.

3794. I withdraw the word encourage—it permits it——

3795. (*Chairman.*) May I interrupt you for a moment, Professor Thorpe; the evidence you have just quoted is from the city of Glasgow where the standard is not 3 but 2·75; at least I understand that is the standard which is adopted by the city analyst, as representing genuine milk?—All he dared exact, I think.

(*Professor Thorpe.*) Of course, I am not aware what standard is adopted by the public analyst there. Do I gather from Dr. Chalmers that the analysts in Glasgow do not adopt the standard prescribed by the Society of Public Analysts?

(*Dr. Chalmers.*) I understand that the figure of 2·75 is used in their certificates.

(*Professor Thorpe.*) Why did they adopt this limit of 2·75?

(*Dr. Chalmers.*) That I cannot tell you.

(*Dr. Voelcker.*) Are you sure of it?

(*Dr. Chalmers.*) Yes.

3796. (*Professor Thorpe.*) (*To the witness.*) That merely means that instead of being 20 per cent. of difference it is some other number; it does not alter the fact. What I wish to put to you is whether by this system of retaining the standard which was adopted eighteen years ago, before the use of the separator was general, the society is not—I will not say encouraging, but at all events permitting the addition of a considerable quantity of separated milk to the general milk supply?—It cannot be disputed that the standard permits the addition of separated milk, and I should be perfectly willing to raise the standard if I thought that practice was at all general.

3797. I can only again refer you to the evidence that we have had, that as regards Glasgow it appears to be general that that is the usual form of adulteration which is practised there?—Very good.

3798. There is nothing I presume to justify us in supposing that Glasgow is peculiar in that respect?—It does not seem to be much practised in the districts that I have personal knowledge of.

3799. With respect to your point that a certain correction should be made in the solids not fat, which implicitly takes into consideration the excessive quantity of fat, I think that is generally acknowledged by analysts?—I think it is acted upon by them.

3800. I think it was first pointed out by Mr. Heisch many years ago that such a correction should be made?—Yes, and I only mentioned it in order to show that it was not lost sight of; that 8·5 must not be construed too rigidly, and that an allowance should be made.

3801. Of course, it can be demonstrated mathematically that it must be made?—Perfectly; it is a question of percentages merely; I put it down, you see, as a tenth, but it is not strictly that.

3802. Has your Society taken into consideration the possibility of varying the standard, not from month to month, but from season to season?—The Society has not, but individuals have, and they have been compelled to do so.

3803. That would mean that they depart from the prescribed standard?—They depart from the rigid standard, and it would be unwise, I take it, for them not to do so in exceptional seasons like that dry summer.

3804. I think it would be very convenient if we knew exactly what is the value of the official method and the official prescription. It appears that they are both departed from?—You must remember that each public analyst is, in regard to this matter, a law unto himself, and he has to use his own judgment sometimes upon limited information in somewhat difficult cases. If it appears to a man when he gets some samples of milks in an exceptionally dry summer when he hears that the cows are very short in their supply, that the deviation from the normal is only small, it seems a reasonable thing for him then slightly to lower the standard, and not to condemn those milks, especially if there is collateral evidence that the milk has not been watered, judging from the quantity of ash which is furnished. I had a note only yesterday, as it happened, from Mr. E. W. Voelcker, suggesting a consideration on that point, which had not occurred to my mind. He says that when there is a deficiency in the solids not fat, which is usually more noticed in the sugar than in the proteids, it looks as though that deficiency were rather due to a falling off of sugar than of the proteids, and that is pointed to by the fact that the ash of milks, although the solids are below the 8·5 standard, does not diminish, but remains normal, or is even sometimes slightly higher.

3805. The object of the Section 4, as I gather, this thing having been threshed out very carefully in the first instance, before a committee, and afterwards in a committee of the House of Commons—was very largely to get over this point of the analyst being a law unto himself?—Yes.

3806. Those matters which the analyst has apparently to take into consideration before he initiates a prosecution were really not properly speaking chemical considerations. They did not belong to him, strictly speaking, in his capacity as an analyst; they were perfectly extraneous considerations, which really ought to be taken into consideration by the Committee, or by those other persons who initiate the prosecution; they are all bound up in the phrase—"raising the presumption"?—Yes.

3807. Now, in view of the fact that the person impugned could bring such evidence as he was capable of bringing, do you suggest that it is desirable to retain your standard of 3 and 8·5 all the year round?—I do not think that the introduction of those words "raises the presumption" shifts the line of responsibility in any degree as far as we are concerned. Of course, we shall adopt the regulations of the Board of Agriculture, as we are bound to do according to the Act, but under those regulations we shall have to apply the standards; it seems to my mind exactly as we now apply our present standards.

3808. Why?—I do not see what else we are to do.

3809. All these collateral considerations which you have said hitherto you have been obliged to take into account are rather removed from your province by the operations of the new Act?—That is quite true; that is one reason why I hesitate to recommend any change of the boundary line.

3810. You deprecate any change?—No, I hesitate to recommend it, because I do not see any place in which it could be fixed more equitably as regards the man who sells and the man who buys.

3811. But surely your own facts which you supplied to the Committee show that that is not perhaps altogether the case; you tell us, for example, that taking the milk all the year round the total solids range from 12·9 to 13·0, and the fat varies from 3·9 to 4·0?—Taking all milks, yes.

3812. Taking all milks, and all the year round, and at all seasons, and at all times of the day?—Yes.

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3813. But if you divide morning milks from evening milks you get a lower average for the morning milks especially in fats, the total solids of morning milks being from 12·5 to 12·6?—Yes.

3814. There the fat varies from 3·5 to 3·6 per cent.?—Yes.

3815. Surely even taking the smallest of those figures 3·5 and 3·6, there is a pretty wide variation between 3·5 and 3·0?—Unquestionably.

3816. What is the abstract injustice of raising the presumption even if you depart from the average, because the probability is that the man's milk ought to be just as much above as below; what is the ethical objection, I mean, to asking a man why he does not conform to an average condition of things?—Not the slightest that I see, but I have no power to do it.

3817. But you have power to point out that he does depart from an average condition of things?—That is quite true.

3818. Under the Act you have the power to call upon him to show why he does not conform to an average condition of things?—I do not think so.

3819. Why not?—I do not see how you can call upon him to show that, except by prosecuting him.

3820. If it means prosecution why not call upon him to show why he does not conform to the average condition?—If you commence legal proceedings against a man for committing an offence that seems to me to be a great step beyond raising the presumption; that is the difficulty I feel in the matter.

3821. But we do nothing more than raise a presumption; we call upon him to explain why he has not conformed to the average conditions?—If you can persuade the legal gentlemen to issue a summons that a presumption is raised that you have adulterated your milk, or that you have skimmed it, and so on, I should not have the slightest objection.

3822. You would have no objection?—No objection at all; but the Act does not provide for anything of that kind as far as I see.

3823. I venture to say that Section 4 actually does provide for that?—I do not think it provides for that case being tried.

3824. (*Chairman.*) Unless the contrary is proved; where is the proof to be given?—It certainly allows a man to defend himself.

3825. But must that be in a court of law?—It must be in a court of law as far as I can see.

3826. "Unless the contrary is proved" it reads?—That is the difficulty I feel. I do not wish to bring an unsubstantial, or an improper charge against a man for skimming or watering his milk, and the only way in which I can abstain from doing that, it seems to me, is not to report a milk as adulterated which passes a certain standard.

3827. (*Professor Thorpe.*) May I point out to you that you are rather seeking to be in the position which the law has hitherto put you in, and that you do not fully recognise the altered condition of things; that is to say, you are still seeking to be what you said yourself you were, namely, a law unto yourself?—Pardon me, that was only in the matter of standards, not in the matter of legal procedure.

3828. You are a judge of first instance?—Yes; one has to form a judgment undoubtedly. I do not mean to say that I am a judge in the legal sense.

3829. (*Dr. Voelcker.*) Would you like to be a machine, that is the question?—No; I mean a man has to exercise his judgment, and has to come to a decision; he is not a judge in the legal sense of the term, and I do not wish to be misunderstood in saying that I am.

3830. (*Professor Thorpe.*) What I am anxious to bring out about this is that there does not seem to me any *prima facie* good grounds—and I am only asking you to defend it if you can—for retaining a standard which was arrived at under a very different condition of things fifteen years ago?—There does not seem to me to be a sufficiently substantial reason yet for altering it.

3831. The altered condition of the law, the altered condition of the procedure is surely a very vital point?—I do not see that the alteration in the law makes it a proper course for a public analyst to say that a milk has been skimmed when it may possibly be a natural milk. I think that if you raise the limit to 3·2 you increase the probability that the public analyst will make such a mistake.

3832. I only wish to get from you, as the representative of your Association, precisely what your position now is under the altered condition of things; you say your Society has not taken into consideration the possibility of taking what we may call a winter and a summer limit?—It has not considered that point.

3833. Do you yourself see any difficulty about that?—No; I think it might very reasonably be established by such an authority as the Board of Agriculture. I see no reason at all why the Board of Agriculture with the amount of information which they have accumulated should not make a limit which will recognise the natural variation between winter, and summer.

3834. We wish to follow that, of course, in all regulations; we do not want to do anything which is unnatural and abnormal in that respect?—Precisely.

3835. But, surely, in the interests of the consumer, we might possibly so arrange these regulations as to fall in with the natural variations—the seasonal variations—in milk?—Yes; and my desire, of course, is to prevent a man from tampering with his milk in any way, but not to impose such limits as would cause unjust accusations to be brought against a man.

3836. There is just one other question I should like to ask you in your capacity as the President: The words of your précis—you will forgive me if I imagine they bear a false interpretation—rather seem to indicate that in fixing your limits you are doing so with the intention of conserving your professional position in not bringing cases where you are likely to be defeated in Court?—Well, one does not like to make a mistake; I do not care about being defeated in Court particularly, and I very seldom have to go to the Court. In many cases my certificate is accepted unchallenged—in 19 cases out of 20; perhaps I might say in 99 cases out of 100, I should think it is not challenged at all.

3837. The words in your *précis* are these: "If prosecutions followed the cases would possibly be successfully defended, and the judgment of the analyst would be discredited and distrusted in consequence"?—And it would.

3838. It is to preserve that?—I point out to the Committee that that is the position the public analyst is in. If a case is taken into Court on his certificate that the milk has been skimmed, and the contrary is proved, it would be said unhesitatingly that the public analyst has made a mistake.

3839. This is what I put to you: In order to preserve the reputation of the public analyst in that respect you rather tend to be on the safe side—to depreciate the standard, in fact?—That is one way of putting it.

3840. Is it the right way?—No. I should say, on the other hand, that I never like to give a certificate of an offence until I feel perfectly sure that a man has committed it. I never give a certificate on what you might call guesswork or presumption, or anything of that kind.

3841. But in order to conserve that position you rather tend to take the low standard?—It follows that the standard must not be exaggerated if you are to keep such a position as that.

3842. Does it follow that it must be depreciated?—Well, I do not know that it does.

3843. You say that you would like to suggest to the Committee "that where it is established that a milk is deficient in fat or contains added water, a standard might be adopted as the basis of calculation in estimating the amount of adulteration which does not assume that the original milk was already of the poorest quality." Would you kindly explain to us what you mean by that?—At present, in calculating the deficiency of fat you assume that the milk originally contained 3 per cent. of fat, but it probably contained much more—it may have contained 4 per cent.—so that the deficiency being calculated upon this limit does not really represent the amount of fat abstracted from that milk. It gives the milkman a large amount of law, so to speak, if you certify that he has taken off a half per cent. of fat. Below three that reckons out to 16 per cent., but if you calculate it from 4 the deficiency would be 37 per cent.; if you adopted a standard of 3·2 the deficiency would then be something like 20 per cent. That is what I meant by that suggestion.

3844. What is the practical outcome of it? What is it that you recommend us to do? You would like to suggest to the Committee something. Now, what is it that you do suggest?—That the Committee should say that where the quantity of fat is less than 3 per cent. in a milk, it may be assumed for the purposes of calculation that the original milk would not contain less than 3·2. That is the suggestion I make. I do not know that it matters very much.

3845. And if you are of opinion that it did contain 3·2 per cent., why not say so at once?—You cannot be sure of that, you see, according to my point of view; but the presumption is that 95 per cent. of the milks do contain 3·2 per cent.

3846. I put it to you whether you are not doing exactly what I have all along suggested you ought to do. You are raising a presumption on a 3·2 per cent. basis by that very act?—Yes.

3847. Then why not recommend us to adopt the 3·2 basis?—Because, you see, in that way you would include milks which are between 3 and 3·2. That is why I do not recommend it to you.

3848. Then you give the person charged the opportunity of bringing sufficient evidence to bear to counteract that statement and to rebut it?—It is a question in my mind whether an innocent man ought to be compelled to do that.

3849. If a man is supplying a product which is below what the community thinks it has a right to expect, it is incumbent upon him as a trader to clear his reputation?—I do not see why his reputation should be aspersed if the milk is such as the cow gave.

3850. It is for him to prove that it is such as the cow gave, but the community has a right to protect itself—is it not so?—The community has a right to protect itself from fraud.

3851. It has a right to protect itself from any white fluid which is given by the udder of a cow and miscalled milk?—The community would not be badly served if it got occasionally milk containing between 3 and 3.2 per cent. of fat. It does not always get it.

3852. We have had it in evidence from several gentlemen here that it would be a very good thing to have a prescribed method of analysis. Are you in favour of an officially prescribed method of analysis?—I think not.

3853. Why?—Because it would have a tendency to become stereotyped, and would discourage anybody attempting to improve the method.

3854. Does that necessarily follow?—It certainly follows.

3855. Necessarily?—Certainly, I think.

3856. Is it not a question of machinery to alter the prescribed methods?—Yes, but it takes a long time to alter anything that is officially prescribed.

3857. But do not you see certain objections in various methods at present obtaining which you yourself have admitted to be more or less affected by errors, and in these methods being brought to bear, so to say, against one another when they are not strictly comparable; is there not a general objection to that?—Undoubtedly. The methods are all more or less imperfect, but the very imperfection of methods induces people to try and improve them, and, as you know yourself, from time to time improvements of a very radical character are made in all analytical methods. I think if you mention total solids and fat as standing at certain figures, and leave it to the public analysts to estimate those by the best methods which they can devise and agree upon among themselves, that that would be all you need do.

3858. That is quite another thing—"agree upon among themselves." I should not object to that?—Without attempting to lay down an official standard; then the responsibility rests with an individual as to the accuracy of the results which he can produce. You must not expect all the results to be entirely concordant, but only in reasonable agreement one with another.

3859. That system means this in effect, that in a court of law you equate the man who takes great pains with a method against another man who uses a rough and ready method of analysis, and in the eyes of the bench (who are incapable of discriminating) those methods are of equal value; surely that from your point of view as a professional man is not a very good condition of things?—You must remember that under the new Act the defence samples are sent to a public analyst. It is not any analyst who is to be employed, but he has to be a public analyst, a man holding a public appointment. I think that he would have to be as careful about defence samples as he is about the samples which he does for his own authority. I do not anticipate any very great divergence or difference of opinion merely arising from the analytical methods being of a slightly different nature. The battle in court has never been about methods as far as I know.

3860. Pardon me, it must be; where, for example, you are fighting a case—I express no opinion whatever about the advisability of the case—where you have an alleged adulteration of three per cent. of added water, there the character of the method is everything?—Yes.

3861. That is true; you might therefore upset, or you might wrongly convict by a bad method, where you have a margin so small as 3 per cent.?—I quite agree.

3862. You do quite agree?—I have no doubt about it.

3863. Surely in order to obviate difficulties of that kind, it would be better to have something like a properly thought-out and officially recognised method?—I should be very glad (if such a thing were possible) to have a conference with the authorities of the Government Laboratory, so that in cases of dispute at all events we may be able to say we have adopted much the same method or process of analysis. But I do not know that it is incumbent upon our society to enforce upon its members any official method. At the same time I think that if we could come to an agreement with our referees as to any methods for the analysis of food products, we ought to do so, and we shall be glad to do so, and then do the best we can to get them adopted by the society.

3864. I am not asking this question with respect to the procedure of the Government Laboratory. The procedure of the Government Laboratory will have to conform to anything that is regulated. I am merely asking generally whether you would not recommend to the Committee, as has been recommended by others, that a public department like the Board of Agriculture, or like the Local Government Board, as the case may be—the Board of Agriculture in this particular case—should prescribe a standard method of analysis?—I am afraid I did not quite understand the purport of your question. I do not quite see my way to advising the Board of Agriculture to establish any official method of analysis at present.

3865. Why?—Because I do not quite see that the Board of Agriculture have any means of establishing such an official method of analysis.

3866. They might invite your own society, for example, to advise them on that point?—We should be glad to advise them to any extent, and that really was the suggestion I was making to you in another form.

3867. I understand you to deprecate the adoption of any uniform system?—Yes. I do not quite make myself clear. I do not wish to advise the Board of Agriculture to institute an official method of milk analysis, but I should be very pleased on behalf of the society to take any steps possible to meet the officials of the Board of Agriculture, with a view to an agreement as to the methods to be adopted in the analysis of milks.

3868. I do not quite see the distinction?—I do not know whether that is clear. The difference is this:—I do not wish to ask the Board of Agriculture to prescribe a method which I shall follow in analysis of milks, but I am quite willing to meet the Board of Agriculture and confer with them as to a method to be adopted.

3869. Is the Board of Agriculture, or are you to express a pious opinion as to the method, or what is the result of this conference with the Board of Agriculture to be? What action is the Board of Agriculture to take—to listen to your representations, and then thank you for them, and then there is an end of it—is that it?—The Board of Agriculture must be represented by men, and if those men meet other men on a committee they can probably come to some resolutions between themselves. I do not quite see where the difference is between us.

3870. The Board of Agriculture is asked here to make regulations?—Yes.

3871. It has been pressed upon us by several of our witnesses that it would be also advisable that they should not only make regulations for determining the deficiency, but that they should further make regulations to determine the methods by which that deficiency

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should be ascertained?—As at present advised I do not agree in that opinion.

3872. Would you rather prefer that the present happy-go-lucky system of each man doing as he likes should be retained?—No, I should like to be in a position to advise the Board of Agriculture if they are going to make regulations as to what regulations are to be adopted.

3873. No doubt the Board of Agriculture would take representations from the President of the Society of Public Analysts—that goes without saying?—It should be somebody else, I suppose.

3874. What is to be done with them—having got them?—There is nothing in the Act about the Board making regulations for methods of analysis, is there?

3875. No, but I point out to you that we are recommended by some of our witnesses that this should be done, and I wish to ask your opinion upon it?—I do not think they were public analysts, were they?

3876. They were persons who were liable to be impugned either as milk producers or as milk vendors; they have suffered, as they say—we have had this evidence constantly—by this unfortunate condition of things, this chaos, this want of uniformity, and they say we do not object to regulations being made; but, in order that those regulations shall be properly carried out and properly interpreted, you should also make regulations as to the methods?—I see; they want to exchange King Log for King Stork.

3877. I gather you do not recommend that the Board of Agriculture should make any such regulations?—Not at all.

3878. There is just one other question. You have occasionally, you told the Committee, had your analysis revised by Somerset House?—I do not know whether it is to my credit or otherwise, but it very seldom happens.

3879. But it has now and again happened. I think you gave us at least one instance?—I am trying to remember how many there have been.

3880. It does not matter?—As far as I remember only three times.

3881. I think generally we were in agreement with you?—The last time you were quite in agreement with me; in fact, I pointed out to my committee that Somerset House must have learnt how to analyse milks.

3882. Must have adopted one of these several methods that you speak of?—Yes.

3883. Which of the particular methods has Somerset House adopted?—I only know the result, and the result agreed with mine so accurately that I thought the work must have improved in the laboratory.

3884. Then, I gather, that on the former occasions they had the misfortune to differ from you?—Yes, once they did. That was a question of coffee.

3885. But we are talking of milk?—I never had a dispute with Somerset House about milks at all; and I think, as a matter of fact, only one of my samples of milks was ever referred. I have no recollection of any other.

3886. On that occasion we agreed with you?—Perfectly.

3887. We have only had one of your milk samples at Somerset House?—As far as I remember only one.

3888. And then we had the good fortune to agree with you?—I had the honour of arriving at the same result.

3889. Therefore, I suppose, by some method or another, which may be yours or may be somebody else's, or may be our own, we arrived at a concordant result?—Yes. The county authorities wanted to congratulate me on agreeing with Somerset House, and I would not have it.

3890. We will not bandy words like that. What I wish to draw out is that whatever methods Somerset House adopts for the analysis of milk they can get results conformable with yours?—They certainly did.

3891. The milk which we should receive at Somerset House, I presume, would be sour milk?—I am afraid it must have been.

3892. I suppose, therefore, it is possible for Somerset House to analyse sour milk and yet get concordant results with somebody who has operated on fresh milk?—Yes. I analysed mine both fresh and sour.

3893. And you got concordant results?—Pretty nearly. I think I made three analyses of that sample.

3894. Have you found any difficulty in analysing sour milk?—Yes, it is rather more difficult to get a correct result.

3895. Why?—Because it is very difficult to distribute the curd uniformly through the sample, that is one reason.

3896. Why?—Why it is difficult to do it?

3897. Wherein comes the inherent difficulty?—It has to be broken up very small—comminated in a careful sort of way, and put through a sieve or something to make it mix thoroughly.

3898. It is a question of care?—Yes, and unless it is carefully done you do not get your sample uniform.

3899. Inasmuch as Somerset House agreed with you when it analysed sour milk and you analysed fresh milk, I suppose the inference is that Somerset House did it carefully?—I have never had occasion to speak evil of Somerset House, and I do not think I have ever done it.

3900. It is quite posible for sour milk to be analysed?—Yes, it is quite possible to get at a fairly correct result on the fat in sour milks certainly, and on the actual solids not fat which are there still which have not decomposed.

3901. What proportion of the solids not fat do decompose; what are the things in sour milk which decompose?—I cannot tell you accurately. I know that the sugar ferments.

3902. Is there anything else that changes in sour milk?—In time, of course, the proteids alter, but that depends upon the time.

3903. Are they likely to alter in such time as it would take for the reference sample to come to us at Somerset House?—In ordinary milks not much.

3904. The main thing that alters is the sugar of milk?—Unless the milk has been mixed with rather foul water which may contain organisms; then the proteids may undergo putrefactive changes more rapidly.

3905. But in the ordinary case I may take it from you that the main thing which suffers change is the sugar of milk?—That is my opinion.

3906. How is that opinion arrived at?—It is difficult to say how one has formed an opinion.

3907. You are not speaking from any practical knowledge of sour milk?—Not from any large number of analyses of milk as regards milk sugar and proteids, and so on.

3908. What is precisely the change which comes over milk in the operation of souring?—What is it? I do not know.

3909. You do not know?—No, not accurately. A certain amount of lactic acid is formed.

3910. How is that lactic acid derived?—From what?

3911. Yes?—From the sugar doubtless.

3912. Under the influence of a specific ferment?—In all probability.

3913. What other changes take place in the sugar then concurrently with the formation of lactic acid?—It depends upon the organisms that are present.

3914. There is one specific organism concerned in the lactic acid change?—Yes; the lactic ferment, of course, changes the sugar into lactic acid.

3915. And what else?—How do you mean what else?

3916. What other product is formed?—Butyric acid is formed also to some extent.

3917. That is another ferment, is it not?—It is formed in some cases.

3918. That is another ferment, is it not?—Yes. Then a good deal of carbonic acid is generated sometimes, and bottles burst, as you know.

3919. Is any carbonic acid formed in the lactic acid change?—Not according to the text-books.

3920. You have no other knowledge than that of the text-books, have you?—No, I cannot say I have investigated that change for myself as a matter of research.

3921. This is what I wish to know from you: Is it within your own knowledge as a scientific man that the initial change which takes place in the decomposition of sugar of milk can be expressed by a chemical equation as accurately as the conversion, we will say, of ordinary sugar into alcohol ; is it within your knowledge that that change can be so expressed ?—No, because there is not only one change. I presume that the sugar breaks up into two molecules of lactic acid, but that is not based upon any research of my own ; I know that from the text-books in point of fact. And I know carbonic acid is generated in the process of fermentation, and that the bottles are burst by the generated gas. I have never examined that particularly further, but there may be, of course, in some cases hydrogen given off if you have other bacteria present.

3922. Is there any hydrogen given off in the lactic acid fermentation ?—I cannot say that there is ; I do not know that there is.

3923. You are not able to tell the Committee that the initial change in the souring of milk is capable of being represented by a chemical equation almost as precise as any other chemical equation ?—I am sorry to say my knowledge does not go so far as that.

3924. Have you any suggestions to make to the Committee derived from your experience as a public analyst as to the mode of collecting and preserving samples of milk which have to be submitted to reference ; is there any alteration in the procedure which you would recommend ?—I have really never thought much about the point. I have been very much dissatisfied occasionally with the condition of some of the samples I have received myself. Bottles of all sorts, sizes, and descriptions are used ; they are sometimes well corked, and they are sometimes badly corked, they are sometimes well labelled, and they are sometimes not labelled at all, but have a piece of paper tied round the neck, and they are sometimes well sealed, and sometimes badly sealed ; sometimes they are badly filled, and they are sometimes quite full.

3925. The object of my question is really to ask you, if you can, to advise the Board of Agriculture, who will have to issue these regulations, and who may at the same time be requested to issue regulations as to the conditions under which these things should be taken and kept ?—If you will allow me I shall be very pleased to send you some suggestions on that point in writing. I have not thought of it as to what could be done practically.

3926. You see it is an important point ?—I do ; I quite recognise that if you are going to lay down regulations you may as well specify something about the size of the bottles, the character of the bottles, and so on.

3927. Have you, yourself, suffered in your practice from the manner in which the samples have been collected ?—I cannot say I have suffered seriously, but occasionally a bottle has burst. There is no system whatever about it. The bottles are of all sorts, sizes, and descriptions.

3928. Do you think it desirable that there should be a system ?—I think so ; something like a neat and uniform method should be adopted. I was talking to an inspector of considerable experience only the other day about his method of taking samples, which seemed to me a very good one. He has a book which is printed. He has four labels printed in it. On the counterfoil he writes the name of the article, the name of the seller, the date, the price paid, and any particulars of that kind at the time of purchase ; then he fills up three other labels with the particulars—the name of the article, saying, for instance, "New milk ; John Jones ; 15th March, 1900." That is all he puts there. He writes that on the three distinct labels. Then he tears them all apart and sticks one on each bottle of milk. His method is very neat and uniform. He seals his bottles well, and he has a good type of bottle, and so on. That seems to me very nearly as well as it could be done, and I could get the Committee, if they choose, a copy of that form for them to see how it is done there. Then there is one other point on it. Printed at the bottom—this is in the county of Berks—is "Superintendent, John Gamble, County Police Station, Reading" ; that is the name of the man who is responsible for the taking of the sample ; so that the dealer who has a reserve sample analysed, knows if he has got that address to whom his certificate should be addressed ; there is the information upon his label. (*See Appendix*, No. XXII.)

3929. Your Society has never taken into consideration this question of the uniformity in the mode of collecting and preserving samples ?—We have never had any common action in the matter ; in fact, I act for three counties and two other authorities, and they all follow their own sweet will as to the method of collecting these samples and labelling them, and so on. It is only well done in two places, and in these two places it is in the hands of one individual man who has got an idea of something like order, neatness, and method.

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3930. (*Major Craigie.*) The evidence that you have been giving us to-day has related entirely to milk. Have you read the reference to the Committee in which the question of the possibility of standards for cream is included ?—Yes.

3931. Might I ask whether the question of the standard for cream has been a matter of consideration before your Society ?—We did not really consider the point. It was understood that this Committee would confine its investigation to standards for milk.

3932. For milk, cream, and condensed milk ?—We did not consider a standard for cream, and I do not know that the Society has ever adopted any standard for cream. I am sure it has not.

3933. You have no evidence that you wish to put before the Committee on the possibility or otherwise of giving a standard or standards for one grade or more than one grade of cream ?—No ; I should not like to offer such evidence without some conference with other members of the Society.

3934. On the subject of condensed milk I put the same question—has the subject of fixing a standard for condensed milk been considered ?—If the Committee wish it I should be pleased to bring what I can get in the way of a collective opinion on that subject also.

3935. But you have not it with you ?—I have not any opinion to offer on behalf of the Society.

3936. (*Chairman.*) The point has evidently escaped you, because these two articles are included in the reference to this Committee. We should be glad of any opinion if you have any to offer from your Society, as it is naturally entitled to a considerable amount of respect ?—It might be able to send you a communication on the subject. Cream, you say ?

3937. (*Dr. Voelcker.*) And separated milk, skimmed milk, and condensed milk ?—Do you want the percentage of fat in condensed milk ?

3938. Or any other standard by which we should fix it ; and also as to the uniformity of method in the collection of tradesmen's samples ?—I will do what I can on those subjects.

3939. Milk is the article which comes more under the purview of Public Analysts than I suppose anything else ?—Yes ; I think the proportion of samples of milk is greater than of any other article.

3940. And it is the one debated point between analysts and Government authorities too ?—Not so much now as in the past.

3941. It has been ?—Yes, it has been.

3942. The figures which are given by the old Wanklyn process of 2·5 of fat, and 9·0 of solids not fat are practically the same as the ones which are now suggested, only under a different process ?—Yes, they include the same materials differently divided.

3943. With regard to the difference of methods you would agree with me, I think, in saying that there were two great classes of methods that one might discriminate between—what one would call rapid methods giving you more or less of an approximation to the truth, and what one would call more or less absolute methods ?—Yes, I quite agree.

3944. You would not class methods as the centrifugal method with the more absolutely accurate ones, such as the Adams' coil method, or the Werner-Schmidt method ?—No.

3945. The quicker methods have rather arisen out of the exigencies of circumstances ?—They have been invented to supply the dairy control with some means of testing their milks.

3946. And these quicker methods have in the hands of skilled persons proved very useful indeed ?—Most useful adjuncts.

3947. At the same time, in the hands of unskilled persons, and where there is no checking of the instruments used, and no means of checking them, they may lead to misapprehension ?—Yes.

3948. You can conceive of such a thing as the graduation being different in different bottles ?—Yes.

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3949. Do you know that such do occur?—Yes.

3950. You have probably had some of these measuring bottles for these quicker methods tried by yourself, and you perhaps have found a want of agreement among them?—Some of them, I think, were fairly accurate; I cannot speak decidedly about it.

3951. But on this point you are certain, that neither you nor public analysts generally would think of taking a case into court, and advising a prosecution upon an analysis done by any of these rapid methods?—I should never give a certificate upon a sample which condemned that sample when I had only used a centrifugal method of estimating the fat; I should not hesitate to employ the method if I wanted to know the amount of fat, or to accept the result, supposing the amount of fat were well over the standard, and supposing that it agreed also with the calculated amount of fat; I should think I was justified then in accepting the result as being an approximation to the amount of fat.

3952. You mean to say that when you have a large number of samples sent you, probably all at one time, a rapid method such as this is very useful, and quite accurate enough for sorting out samples?—It is very useful indeed.

3953. But if the result of such a sorting out process were to throw doubt in your mind upon the genuineness of any sample of milk you would then proceed to use some of the more exact methods of which we have spoken?—Yes.

3954. And you would not think of giving a certificate that was not based upon one or other of them?—Certainly.

3955. We have heard about the Adams' method, but you would hold that others have been shown to give practically as good, and as accurate results as that?—Yes, there are other ways of sampling the milk by extraction with ether.

3956. Which are in some ways less cumbrous?—Yes. I have not practised them, and I cannot speak from personal knowledge of how they work out.

3957. Though the Society of Public Analysts at one time put out a certain method as being one which they recommended for adoption, the adoption of other methods by certain of their members has not been on any ground other than that they have found the others give as accurate results on the whole?—Yes.

3958. And they have proved rather more convenient?—Doubtless. A man has found the method which he has adopted more convenient than the Society's method, and has satisfied himself that it is an accurate method.

3959. Their accuracy has been agreed on not only by the individual working, but also by his brother chemists?—No doubt. The accuracy, of course, in those cases is approximate, not absolute.

3960. In your opinion does everything depend on the method?—Not everything.

3961. And supposing you did prescribe any one method, does it mean to say that in the hands of each individual working it you would always get the same result?—I think not; in fact, I am certain not.

3962. Then if there were this conference that you mentioned to Professor Thorpe, between the Government authorities, and the Society of Public Analysts, do you think if it was brought about that it would be the feeling of the members of the Society of Public Analysts that one method to the exclusion of all others should be adopted, or would it not rather take the line that there were certain ones which were equally good, and which might be, so to say, sanctioned, but that there should not be one exclusive of all others. Would that not be the line?—I am certain it would. I can only quote in that respect a remark which was made at a meeting of some of the members a little time ago when one of the persons present said: "We are not bigoted, but we like our own way."

3963. Are you surprised then that the attempts of the Society to enforce any one method of analysis have resulted in what we find now throughout the country adopted by public analysts, namely, that they use several recognised methods instead of one uniform method?—I think the Society never attempted to enforce the use of that method, but merely recommended its adoption.

3964. And you think with the general advance of knowledge and science it is better that there should be this freedom resulting in further enquiry?—Yes, unless it leads to great discrepancy in the results obtained.

3965. But your experience is that of late years, at all events, the differences where cases have been brought into court have not rested so much upon the practice of one particular method or the other?—I think that question has seldom been raised.

3966. May I suggest that this was possibly a difficulty with public analysts; a want of knowledge as regards the actual standard adopted by Somerset House?—Would you ask me that again. I am not quite sure what the question was.

3967. Was it not the cause of some difficulty to public analysts that when making their returns they did not know what standard Somerset House, the Government authority, adopted?—They have felt that difficulty at times undoubtedly.

3968. And has that not led to the choosing by individuals of standards of their own?—Yes, possibly.

3969. And has it not led to divergences between different analysts, and have not these divergences been brought into court, and have they led altogether to their credit?—The divergences have been generally on matters of opinion, not on matters of method.

3970. But if one man took a 3 per cent. standard and another one said he took the Government standard, which he believed to be 2·75, that alone would account for one man's opinion differing as to the validity of the certicate?—Yes; it is commonly stated in court that the public analysts' standard is a very severe one.

3971. Then following as a consequence on that, is it not the case that many public analysts have passed as genuine samples which they had very good reason to know were adulterated?—No, I think not.

3972. You do not think so?—Not to know they were adulterated.

3973. I will put it that they had great suspicions about it?—Yes, samples which are questionable.

3974. And their action in the way of securing a better quality of milk to the public has been very much hampered by the belief that a standard was adopted at the Government laboratory which was very much below the actual facts as to the quality of the milk produced on the farm?—Their action has been hampered.

3975. I mean their action in reporting on adulterated samples?—I suppose it must have influenced some men occasionally in giving their certificates.

3976. I put it to you in this way; an analyst certifying, or about to certify on an adulteration has had before him the knowledge that the sample may be referred to the Government authority?—Yes.

3977. Would not, therefore, the tendency be for him to err on the side of leniency?—Undoubtedly.

3978. And not only has he been influenced by considerations of not doing an injustice to a producer or retailer, but he has, whether he intended it or not, been bound to consider his own reputation in the matter?—Most men would wish to keep on the safe side, which is another way, perhaps, of putting the same thing. I do not know that an analyst is particularly conscious of his own reputation. His desire is, no doubt, to do that which is straightforward and right under the circumstances, and he lets his reputation take its chance if he sticks to that line of conduct.

3979. Therefore a number of analysts, of whom we have heard something to-day, have all along gone on a standard of 2·75, not because they knew it represented the quality of the milk of the country, fairly, but because they had an idea that it was the standard adopted in the Government Laboratory, and because they knew if they were brought face to face with the analysis from Somerset House, that their credit with their local bodies, who employ them, would be at stake?—I suppose some men feel that. You see it has not occurred to me, so that I cannot speak very definitely on that point.

3980. But though it may not have occurred to one in your happy position, you must be well aware of the fact that it has been a common subject of consideration among analysts throughout the country?—Yes, I have heard it mentioned.

3981. And this has conduced to many of them being guided by a lower standard?—I think such considerations have certainly helped to keep the standard lower. One thing which is felt about the proposal now to make the standard definitely of any figure—3 per cent., or any other—is that that would be a real standard officially established, and therefore a standard of authority. That would really raise the standard, although not nominally.

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3982. Would you go so far as to say that since an idea has got about—you hint at it in your *précis*—that the Government standard has been raised, analysts have been rather more bold, and that they have taken good courage, and have raised their standards themselves?—As a matter of fact I saw it printed in a newspaper that there was such an alteration in the standard, and I believe the Secretary of the Society of Public Analysts inquired of the Government Laboratory whether the alteration was official, and we have not had any very definite answer to that question as yet. I say we have not yet been officially informed, although as a matter of fact, we know it.

3983. (*Professor Thorpe.*) Have you got the answer that was sent to you on that occasion?—No. We have not been informed officially so far as I know.

3984. Have you had no official answer to the request of your secretary?—Yes, the Secretary had an answer. (*See further evidence,* p. 286.)

3985. Presumably that was an official answer, was it?—Yes, the answer was official enough, but the answer was not an official statement that the standard was 3 per cent., as far as I remember.

3986. Was there not a question officially addressed to the Government Laboratory by the Secretary of your Association?—Yes.

3987. And an official answer was sent?—Yes.

3988. Saying it was an unofficial statement?—Yes, there was a statement made; that is quite true. My memory may be wrong, but unless my memory is mistaken the Society was not officially informed that the Government Laboratory had adopted a standard of 3 per cent. for fat. I believe the Secretary wrote, and asked for a copy of a certain circular, which was published in "Food and Sanitation."

3989. Was there any circular published?—He was informed that no circular had been published.

3990. That is true; of course there was no circular published?—He was informed so.

3991. Is the Society in the habit of getting official communications from the Government Laboratory?—Yes, certainly.

3992. Of standards?—No, never.

3993. Never?—Never, so far as I know.

3994. Therefore you are not surprised that you got no official communication as to any alteration of the official standard?—I am not surprised in the least.

3995. It is not part of their practice to officially communicate anything about standards?—No doubt it is very difficult to get anything out of the Government Laboratory of that kind. You may ask for it.

3996. I suppose you are aware that the Government Laboratory has no power to issue official standards—it is not within its competence to issue anything in the nature of an official standard?—I know that the Government Laboratory has not any power to issue.

3997. You know that it has not the power?—Yes; but our Society would have been very pleased to have had a copy of the document which was published in the paper, so that they might have had that before them as an official statement of the practice of the Government Laboratory.

3998. The document which was published was a simple private letter of a type very similar to hundreds of similar private letters which have been given to individual analysts asking for information; is that not the fact?—I thank you for telling me, I did not know.

3999. Did you see the letter which was sent?—I saw what was printed in "Food and Sanitation."

4000. Did you see the letter which was sent in response to the application of the Secretary of your Society?—Yes, I saw that letter.

4001. It was there stated to be a copy of a letter addressed to an individual analyst in response to an application made by that analyst for information; was it not so?—If you say so, of course it was.

4002. Then you have not seen the letter am I to understand?—I have heard the letter read; I was at the Council meeting when it was read.

4003. Did it not at once on the face of it show that it was simply a copy of a private letter sent to the gentleman in question?—Yes; but the Society would have been very glad to have acted upon something which was not private, and which was not published in that sort of way; the Society would have been very glad to have had something definite.

4004. May I point out to you that that is not consonant with the practice of the Government Laboratory; we have no power to do anything of the sort; there is no authority vested in the Government Laboratory to enter into official relations of that kind with the Society of Public Analysts?—I will ask the Secretary to write as a public analyst in his private capacity to get the information then.

4005. (*Dr. Voelcker.*) Whether the information was authoritative or not, it was an action that was very much approved by the public analysts of the country?—We were glad to see it undoubtedly.

4006. The hanging back has not been on the part of the public analysts, but they have been rather trying to urge it forward up to now, I think?—We have always tried to work, as far as our means would allow, in the most harmonious way with Somerset House, both in the past and in the present; and I hope that these friendly relations may long continue.

4007. Having seen the standard by which cases are practically decided in Court, raised from 2·75 to 3 per cent., you are now anxious not to go ahead too quickly so that the other extreme may not be gone to?—I would go ahead at once if I thought it was fair to do it.

4008. You have told us that it has been your practice, and I am sure it has been that of many other analysts, to take the circumstances into consideration as well as the analytical figures?—What circumstances?

4009. The circumstances regarding a sample of milk, namely as to the time of year it was taken, whether in a droughty season or not; you have taken other circumstances into consideration besides the actual figures yielded on analysis?—Occasionally I have acted upon such considerations.

4010. But I take it that in answering Professor Thorpe your feeling with regard to the new procedure was that it would practically reduce the analyst to the position of a machine?—He can never be quite that, of course; the skill which is involved in his work, of course, precludes that.

4011. But his duties would be confined to the setting out of certain figures, leaving other people to deal with the interpretation of them?—His responsibilities would certainly be limited.

4012. Do not your local authorities look to you very much to advise them in regard to the issuing of prosecutions, and the taking of legal steps?—Not much.

4013. But you are aware that in many parts of the country they rely almost entirely upon the public analyst's certificate?—They ask my opinion in doubtful cases. Supposing the quantity of water is certified under 5 per cent., they ask my opinion then as to the advisability of a prosecution perhaps, but in ordinary cases they never ask me any question. I have no voice in saying whether there shall be a prosecution, or whether there shall not be a prosecution; and sometimes I never hear that there has been a prosecution, or what is the result of it unless it is in one of the places which has a local paper at Oxford. If it is in Buckinghamshire or Berkshire I may not hear the result for months, if at all.

4014. If in future you put your reports in such a way that you simply gave the figures of the analyses, and said that they raised a presumption that there was a want of genuineness, although you shifted the responsibility on to the shoulders of other people, you would feel that the position of the analyst then would not be quite the same as before?—If I put in my report: "These figures raise a presumption that the milk is adulterated," they would say, "What do you think; is it adulterated; what shall we do?"—that is what they would say.

4015. So that you view with some alarm the analyst being put in the position of merely giving figures and leaving other people to settle upon them?—I know other people are incapable of settling upon the figures; they are helpless if you give them figures only.

4016. That is what I suggest to you. The public analyst is also met with a good deal of difficulty in respect to his want of knowledge of the previous history of the samples, is he not?—He has no knowledge.

4017. He has no knowledge what sort of cows they came from?—Not a bit.

4018. Whether they are morning or evening milk?—No.

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4019. And when he certifies as to the amount of adulteration if he finds such, in his belief, he is under considerable difficulty what standard to go upon, not knowing the original quality of the milk?—Yes.

4020. And so it may come about that a certificate may be given certifying to very much less adulteration than has actually taken place?—It usually is the case.

4021. It is usually the case that when a public analyst returns a certain amount of adulteration, if the truth were known, and if the analyst was not actuated by desires to keep on the safe side, the adulteration would be returned very much more than is actually given?—Yes; the present standards admit of that.

4022. The present standards admit of adulteration?—They minimise the proportion.

4023. So that in giving a certificate you are obliged to take a liberal view?—I do not quite know what a liberal view means.

4024. Taking a not high standard of milk as your basis?—If we assume a standard of 8·5 of solids not fat, and 3 of fat, we have already given to the milkman perhaps some shade of a benefit.

4025. Now, knowing what you do of the collection of samples, is it likely that the samples sent to the analyst would be better or worse than samples taken from a farm?—The probability is that they are slightly worse, because they may have passed through more hands.

4026. They cannot be better, can they?—They cannot be better.

4027. So that your figures taken from the statistics of analysts really represent absolute minima?—Yes.

4028. And under the existence of these absolute minima as standards, it is clear that there is room left for a considerable amount of adulteration?—There is theoretically room for a considerable amount of adulteration.

4029. And is it not the case that it is only the fear of exceptional cases occurring which prevents you with certain other analysts advocating the fixing of a standard above 3 per cent. of fat?—It is the fear that exceptional cases will arise.

4030. Your statistics generally show that the composition of milk is well above 3 per cent.?—In practice.

4031. What keeps you from going for a higher standard is the fear of exceptional cases, and of you yourselves being brought into disrepute?—Those are two things, yes.

4032. Those are the two things. Those views that you have put forward are not the views of all the members even of the Council of the Society of Public Analysts, I think—the view I mean as to not adopting a higher standard than 3 per cent. of fat?—Some members of the Council would advocate the adoption of a higher standard.

4033. Might I go so far as to ask if there was any wide divergence in the opinions as regards the number?—I do not know that I ought to say as regards the numbers of the members of the Council. I have stated in my draft evidence that in the opinion of some members of the Council, whose opinion is entitled to the utmost consideration, the standard might fairly be raised.

4034. I take it a considerable number of them think so?—I think a substantial number.

4035. So that while the majority, I take it, wished to be on the side of caution still there was a strong feeling among others that the standard ought to be put higher than 3 per cent. of fat?—There was a strong feeling among others.

4036. And even those who felt with yourself that it was advisable to keep to 3 and 8·5 thought it might go above the 3 in 90 cases out of 100?—Yes, everybody knows that.

4037. Even if you had a milk which gave 3 of fat and 8·5 of solids not fat there might be other circumstances brought out by the analyses which would lead you to be suspicious even of that milk, might there not?—Certainly, if a milk contained those ingredients both at the lowest figure it is obviously a milk of the poorest possible quality to be passed as genuine, and in all probability is not a genuine milk—there is a very strong presumption, at any rate, that that milk is not genuine.

4038. So that even if you fix what would be a higher standard than has been recommended all along, that is, a standard of 2·75 and 8·5—if you take 3 and 8·5 there would still be a considerable presumption that the sample was adulterated?—I think so in some cases.

4039 Can you tell me from your own analyses whether you have got any samples coming materially below 12 per cent. of total solids which on full examination have convinced you that they were genuine?—I have occasionally felt bound to pass samples which were rather under 12 per cent.

4040. Occasionally you have found them just under?—Yes; you see you can have a milk with 8·5 of solids not fat and 3·4 of fat—that would be 11·9; and it would not be right to say that that milk was watered or skimmed.

4041. You could not prove that it was?—No, you could not feel sure that it was unless it was abnormal in some way.

4042. But you could agree that you could produce that same milk by tampering with it?—Yes, you could on paper, if you had a milk of known composition. One of the points in my evidence is that that kind of tampering presupposes a certain amount of preparation and appliances, which are impossible in nine-tenths of the cases.

4043. It wants skilled hands?—The ordinary farmer cannot get his milk analysed to that degree of accuracy that he could produce such a result as this.

4044. That would not apply to a factory?—It would not apply to a factory.

4045. Have you any distinct reason for preferring a standard of 8·5 of solids not fat, and 3 of fat to a statement of the total solids including so much fat, say "12 per cent. of solids including 3 per cent. of fat," or "of which not less than 3 per cent. should be fat"?—I should be satisfied with milk which would fulfil those conditions, but they do not very often arise.

4046. If a milk gave below 12 per cent. of total solids, do you not think it might very reasonably raise a presumption that something was amiss with it?—Yes, it always does in my mind.

4047. (*Chairman.*) Another witness suggested a minimum of fat of 3 per cent. with a total of other solids of 8·5, or a total of all solids of 12 per cent., even if either of the other constituents ran below the minima prescribed. Would you object to that?—I should not object to it.

4048. If it was possible to arrive at such a standard?—If you can arrive at it, I should not object to it at all personally. The matter was mentioned between us, but we did not resolve that we would recommend it. You would find that it would cover a very large number of milks which are all right.

4049. Therefore, it looks to be rather a good suggestion?—Contracts are sometimes made on that basis.

4050. (*Dr. Voelcker.*) With regard to the forms of adulteration and the way in which you would detect them, on the addition of water, how would you find the constituents of the milk altered?—The percentage do you mean?

4051. Yes, if watered?—The percentage of the fat is lowered, and the percentage of the solids not fat, taken together, is lowered.

4052. Everything would be lowered except the water, would it not?—Yes, the percentage is lowered of the constituents of the milk.

4053. If you had 88·5 of water in the analysis of a milk, would you expect that milk to be adulterated with water?—Yes, probably. That is the case of a milk with 8·5 and 3·0.

4054. (*Chairman.*) Are we to understand that with 3 per cent. of fat and 8·5 not fat, or a total of 11·50 the remainder would be water?—That milk has probably been watered down to those limits if it is exactly the two. It is the lowest possible genuine milk according to the limits.

4055. I understand that if it had these various ingredients that would raise a presumption that it was genuine?—If it falls below, the presumption is that it is not genuine.

4056. (*Dr. Voelcker.*) You will agree with me that if he got an analysis of milk showing 88·5 of water, the presumption would be that the sample was an adulterated one?—That would be one's first impression, and one would want to know more about it. There would be a doubt about it.

4057. (*Chairman.*) I do not understand this. According to what I understand, such a milk would reach your ideal standard?—Taking those figures as they stand, by themselves, the milk is evidently the lowest possible quality that could be. If you have got 11·5, and no other information, you could not say what had been done to it. You would then have to determine the fat; if you found that it contained 4 per cent. of fat, then you would be certain practically that it had been adulterated with water.

4058. (*Professor Thorpe.*) If it contained 3 per cent. of fat?—If it contained 3 per cent. of fat, you would think probably it had been skimmed, but you could not certify it, because it is just on the standard; if it contained 2·5 per cent. of fat, then you would feel that it had certainly been skimmed, and you would return it as such?—Yes.

4059. (*Chairman.*) That I follow; but what I do not understand is, when it reaches your own ideal standard, 3 of fat, and 8·5 of other solids, you instantly suspect it to be adulterated?—When I knew it contained 8·5 plus 3, I should say to myself: this is the poorest possible quality of milk that could be produced by a cow. I should not be justified in reporting it as adulterated, but I believe it probably is. That is a milk that you must let go; you cannot touch it.

4060. That is what you call your own model milk?—I beg your pardon; it is not my model milk. It is like the man who is let off—not guilty, but don't do it again.

4061. Still, if we accept what you wish to lay before us, we should recommend to the Board of Agriculture that if milk is found with 3 per cent. of fat, plus 8·50 not fat, it raises the presumption at once that that milk is genuine; is that not so?—Yes; but if you put it in that form it would be a very bad way to put it, I think.

4062. (*Professor Thorpe.*) I would remind you of the position in which you now stand. You come here officially expressing the view of the Society of Analysts, and at the tail of your evidence you now say that 88·5 per cent. of water justifies an opinion that the milk is adulterated?—No, pardon me, that it might be adulterated; it might be skimmed or it might be such a milk that you are obliged to pass it with those standards.

4063. (*Dr. Voelcker.*) It would raise a presumption that it was not all right?—Yes.

4064. (*Professor Thorpe.*) Whether it be the absence of fat or the addition of water is for the moment immaterial, but there is a presumption raised against the genuineness of that milk?—Pardon me; you will have the same difficulty whatever standard you fix. You will have the same question precisely arising whatever the standard is when the milk is on the line.

4065. (*Dr. Voelcker.*) Now, I put it, having milk giving 88·5 of water, and having your suspicion raised about it, might you not then very well go further and determine the amount of ash in that?—Yes.

4066. And if you found the amount of ash materially below 0·7 per cent, would you not say that you had no doubt then that the sample was adulterated?—Did you mention the solids not fat in that question?

4067. I simply gave the water 88·5?—Then I can answer the question. If I found that the ash of a milk which contained 11·5 total solids was below 0·7, I should think it extremely probable that I should also find in that same milk the non-fatty solids below 8·5, and I should not form a decided opinion about it until I had ascertained what those non-fatty solids were.

4068. (*Professor Thorpe.*) We ought to be quite clear about this. In other words, if you got a milk with 11·5 per cent. of solids, and you determined the amount of fat, and you found it 3 per cent., you would think it now necessary to determine the amount of ash?—No; if the fat were exactly 3, and the solids not fat 8·5, I should not think it was necessary to determine the ash at all, and probably should not do it.

4069. You say that you think even then it might have been tampered with?—Yes, possibly.

4070. And in order to confirm or remove your suspicions you would proceed to determine the amount of ash?—I do not think it would help you very much in that case.

4071. I gathered that was the tenour of your answer to Dr. Voelcker?—Was it?

4072. He was rather asking you whether it would not be necessary to go further?—He put the ash first.

4073. I gathered that the object of the question was to elicit whether in those circumstances you ought not to call in some other criterion, namely, the ash?—Yes. It is useful to determine the ash to enable you to confirm a judgment as to whether water has been added or not. If the non-fatty solids came to 8·5, but the fat is 3·0, I do not think that one is justified in condemning the milk; one may report upon it adversely, and say anything one likes about it as being a poor sample of milk, and so on, but you must let it go.

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4074. If in order to remove your doubt you went and determined the ash, and you found it below 0·7, we will say, what would be your attitude of mind then?—If the ash were below 0·7 I should say it was an abnormal milk—that is to say it is an irregular thing for the ash to be below 0·7 with the non-fatty solids at 8·5. It does not seem likely to arise. Probably if I got a milk like that I should say "I wonder if there is anything in it besides milk; I wonder if there is any sugar, or anything of that sort." I should search then. That is the kind of question that would come up in one's mind. If there were marked deficiency of fat I should feel bound to look for something else. Dr. Voelcker is putting a case which is almost impossible in practice when he speaks of the ash being below 0·7, with 8·5 of solids not fat.

4075. (*Dr. Voelcker.*) I give you this analysis—88·5 of water, 3·4 fat, 8·1 of solids not fat; would you agree with me that that might be a rich milk watered down?—Perfectly.

4076. If we get a standard of 3·0 and 8·5, or an equivalent of 11·5 total solids, would you report that milk as adulterated?—Yes, with 8·1 of non-fatty solids, because that contains between 3 and 4, or 5 per cent. of added water to bring it down to that.

4077. If it was 8·4 non-fatty solids and 3·1 of fat?—What should I do?

4078. I will tell you what you would do, you would determine the ash?—I should determine the ash as a matter of fact, certainly.

4079. You might also determine the amount of nitrogen if you were still in doubt?—My opinion about such a milk would be that it was probably watered, but that the amount of water added was not very large.

4080. But in order to satisfy yourself it was watered you would, after determining the fat and the solids not fat, probably determine the ash and the nitrogen as well?—Yes, probably, if I wanted to be quite certain about it.

4081. To meet the case of separated milk, if you found an analysis which, though it gave figures within your limits showed a very high ash, or a very high nitrogen, you could on the strength of that say that the fat had been removed, or that separated milk had been added, could you not; if you found an abnormally high ash what would be the effect of adding separated milk to genuine milk; how would the constituents be altered?—The constituents would be altered in this way. Assume that the milks were identical to begin with, assume that you had taken away practically all the fat from half, and then put them together: the proportion of the constituents would be altered in this way, that the percentage of the non-fatty solids would rise, and so in accordance with that rise there would be an increase in the percentage of all the other constituents—the ash, the nitrogen, and the sugar—to that degree; but that rise would not be a very large one.

4082. But would the total solids be increased?—The total solids, of course, would be diminished by half the fat.

4083. They would be lower?—Yes.

4084. Although the solids not fat would be increased?—Yes, but then, doing it as I have said would take away half the fat from the milk, that is to say, it would bring it down from a milk of 4 per cent. to a milk of 2 per cent., and that is precluded.

4085. If you had the milk of a Jersey cow, and then added separated milk to that, and watered it down, or worked it down to a standard, how could you detect the addition of that separated milk in any way except by determining the amount of the ash and the nitrogen, as well as the solids not fat, and the fat; what other possible guide would you have?—You would find that there was an abnormal amount of non-fatty solids, that the ash was high, and so on, and that the nitrogen was high.

4036. You would find that the nitrogen was high?—Yes.

4037. And they would be a guide to you as to whether separated milk had been added or not?—It might suggest itself to one's mind that that was the explanation of such a sample.

4088. I put it to you that having a sample about which you were in doubt you would go further, as you have said yourself, in this matter, and you would base your ultimate judgment upon whether concurrently with these variations in the fat and the solids not fat you found an increased nitrogen or an increased ash?—Yes, undoubtedly.

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4089. Is it not very material that they should be taken into consideration in laying down the basis of a presumption as to adulteration; or do you think that they are not sufficiently important?—I think it is within the competence of every analyst to use such data as he can get from analytical work, but I do not know that it is necessary for the Board to make regulations on those points.

4090. I put it to you in this way. If a standard be fixed stating simply the fat and the solids not fat, and that have legal force, and the analyst had merely to repeat those figures with nothing more than that to guide his Council, will not a great number of milks that have been adulterated, or rich milks that have been watered down by the addition of separated milk pass these standards which an analyst, if he were at liberty to fix his judgment upon the amount of the ash, and the nitrogen, and the other constituents would be able to detect?—The milk might certainly be adjusted to pass those standards as you say, and if that were done I do not see how it is possible by ash determinations, or by nitrogen determinations absolutely to prove the contention that separated milk has been added. I do not see that it is possible to prove it.

4091. It would not be possible to prove it?—No.

4092. Not in very narrow cases?—No; and then, I think, if you lay down a limit for nitrogen in milks you must lay down an inferior limit, and not a superior limit, and that inferior limit would not help the case you are supposing.

4093. But you would agree that where a considerable quantity of separated milk has been added to whole milk, especially if that milk has been rich milk before—and we have had it in evidence that that does take place in Glasgow and other parts—the giving of another constituent—of the statement of the amount of nitrogen and ash, for instance—would be an additional security against adulteration taking place?—It is not a security at all, I think, because you could not put an upper limit to nitrogen; you could not say that the milk shall not contain more than such and such a percentage of nitrogen.

4094. You told us just now that when you got 88·5 of water, although your other figures were satisfied, you would look farther, and if you had found the ash low you would be of opinion that the milk was adulterated, and that water was added?—Yes.

4095. Do you not think it desirable that the Board of Agriculture in framing a standard should take that into consideration?—Yes, I do think it is desirable that they should take it into consideration; but I do not see how you can lay down a standard which will enable them to do so; that is my difficulty. I should like to calculate it out, but I think the difference would be very small as far as I can judge.

4096. Do you think it would be desirable to prescribe other constituents than the solids and the solids not fat as existing in certain proportions in milk in order to constitute it genuine?—I do not think it would be desirable to prescribe such limits, and I do not think if they were prescribed they would very much assist either the Board or the analysts in the object they have in view.

4097. You would admit that in doubtful cases an analyst would make use of them?—They confirm his own judgment in a certain direction.

4098. You mentioned that it might be desirable to give a variable standard according to the time of the year?—Yes, that might be practicable.

4099. Do you not foresee that there might be very great difficulties about that; if, for instance, there was a standard fixed from January to March of 3·2 of fat, and from April to May of 3 per cent., and so on?—I believe there would indeed.

4100. You would have the defending counsel say, "My Lord—or gentlemen—the cow was allowed to deliver milk in one month which contained 3 per cent of fat, but this month she must not do it" that is a conceivable thing?—I do not wish to enter into what the counsel would say.

4101. There would have to be put out a notice that up to the 31st of March cows may provide milk of 3·2, and on the 1st April they must be foolish enough to produce only 3 per cent.?—Yes.

4102. I understood you rather to advocate a variable standard?—I beg your pardon, I did not. I assented to it, but I do not think I advocated it.

4103. Do you think you still would not?—I believe my answer took this form: if it were practicable.

4104. Do you think it is practicable?—I have my doubts. I have to lay before the Committee that the position of our society is to keep one standard for all conditions. The responsibility I am putting upon the Board of Agriculture; if the Board of Agriculture advise that they can have different standards in different months, then we are executive persons, and we should adopt those standards and work to them.

4105. I have only one question more, and that is, you would agree that if the milk gave 12 per cent. of total solids or above, it ought if genuine to give 3·2 of fat at least?—Yes.

4106. And you would not mind altering the recommendation of the Society of Public Analysts in that direction, or would the members have any objection to altering it?—That is another complication. If it contains upwards of 12 per cent. of solids, of which 3·2 is fat, who is going to find fault with it? I do not see what the objection to it is.

4107. If it gave 12 per cent. of total solids and only 3 per cent. of fat, both of them within your limits here, would you have any doubt yourself that that was an adulterated milk?—I should say it is probably mixed with separated milk.

4108. Although it comes well within?—Yes; I know that is the fact, but I should think it probably was mixed with separated milk.

4109. I quite agree with you that that would be probable. Then, do you not think it is desirable to bring in some other clause to cover such a case as that—to say, for instance, that if a milk yields 12 per cent. of total solids or above it must contain 3·25 or above of fat?—Desirable? Well, if possible; but I doubt the practicability.

4110. If that provision were added to such a provision as yours, would it not be the means of excluding a great deal of the adulteration that goes on through the country; that is the point I put?—Yes, it would shut out some samples which would now pass; it would shut out some, but not a large number.

4111. I put it to you, are not a very large number of the cases of adulteration that are reported on those very lines?—Yes, and this would shut out some of them.

4112. Is that not the more frequent case than cases of the addition of water?—I can hardly say whether it is more frequent; it may be in some cases.

4113. We have had to-day in evidence, and I think your experience would lead you to agree with it, that where adulteration has taken place on the farm, it has been by the addition of water?—I expect it is mostly.

4114. Which is not such a very hard thing for the analyst to determine; but that the subtle cases of adulteration have been those which result in the production of a milk giving 12 per cent. of total solids and only 3 per cent. of fat?—Yes.

4115. Which adulteration has generally taken place with the retailers?—Possibly.

4116. Then, I put it to you, would not your standard be usefully supplemented by the addition of a proviso somewhat in these words, that if the total solids in the milk are 12 or above, the quantity of fat must be at least 3·2 or 3·25 in order that the milk may be genuine?—I should hesitate to adopt that.

4117. We have it from Dr. Dyer that he is in agreement with that—you differ from him for fear——?—I should hesitate to adopt it for fear that it might trap some genuine milks.

4118. How would it?—I think it would sometimes.

4119. This is an addendum to the proposed standard; it does not stand by itself, does it? You have yourself suggested a sliding scale and that an allowance be made?—I think if you have got your 3 per cent. of fat, if that is the limit adopted, it is no use to try and fight for more just about that particular point. You will not get your milks just at that particular point. If people put separated milk in they will put it in, and it will not come exactly to that composition of 12 and 3. Besides, you would be in this position, that if the milk contained 11·9 of total solids and 3 of fat you would pass it as genuine, but if it contained 12 per cent. of total solids with 3 of fat, you would say that it raised the presumption that it was adulterated.

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4120. Then, I put it to you, knowing what the composition of milk is over the country, would it not be very much better if you and your society advocated the raising of the standard above 3 per cent. of fat? If the standard were 3·2 of fat, would that not in itself exclude a number of these cases of the addition of separated milk?—Undoubtedly it would a certain number.

4121. Did your Council have under consideration such a proviso?—Yes.

4122. What was the feeling?—The Council considered the point whether it should take a 12 per cent. standard, and somebody pointed out that if you took a 12 per cent. standard as being of itself sufficient that would allow of a case like this, where the separated milk is added and the total makes 12; and, therefore, for that reason, we did not recommend any total solids standard at all, but we took our two standards, as we always have done, separately and individually; it was in our minds, I mean, that that would be possible.

(For Mr. Fisher's further evidence, see p. 286.)

SEVENTH DAY.

Wednesday, 4th April, 1900.

PRESENT:

Lord WENLOCK, G.C.S.I., G.C.I.E. (*Chairman*).

Mr. GEORGE BARHAM.
Mr. GEORGE COWAN.
Major PATRICK GEORGE CRAIGIE.
Mr. SHIRLEY F. MURPHY,
Professor T. E. THORPE, F.R.S.
Dr. J. AUGUSTUS VOELCKER.

Mr. R. HENRY REW, *Secretary*.

Colonel CURTIS-HAYWARD, called; and Examined.

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4123. (*Chairman.*) You have been good enough to come before us to give us the benefit of your experience in connection with a matter that we are enquiring into. You say you have had a large herd of cows for many years, and you have also bought milk from the neighbouring farms?—Yes.

4124. You are a member of the Technical Education Committee of the Gloucestershire County Council, and you serve on the Agricultural Sub-committee, which has charge of the County Dairy School, where milk is tested morning and evening?—Yes.

4125. In your own dairy you say you have kept a weekly record of the amount of milk taken to make a pound of butter?—Yes.

4126. You find a great difference in the quality of the milk of individual cows, particularly between the morning and evening's milkings?—Yes.

4127. Have you any figures in connection with that matter?—Yes, I have a number of figures here.

4128. Perhaps you would like to explain how you would wish to present them to the Committee?—I have got here the tests of both morning's and evening's milk, which has been supplied to our dairy school for the years 1898 and 1899. Take the first one in April; there were only two tests taken in April, because I think it was nearly towards the end of April before the school began making cheese and butter. I find that the first test in the morning had only 2·8 per cent. of butter fat, the solids not fat being 8·7, the total solids 11·5, and the specific gravity 1032. In the evening from the same farm there was 4·6 per cent. of butter fat, 8·9 of solids not fat, and 13·5 of total solids, and the specific gravity was 1031·4. That shows a difference of 70 per cent. upon the same farm in the richness of the milk.

4129. Was this taken from a number of cows, or from a single cow?—From the cows supplied by a farm for the Dairy School.

4130. How many cows would that be?—I cannot tell you; I should fancy from the size of the farm there would be seven or ten cows, or something like that.

4131. The average works out to 2·8 of fat in the morning?—On that one morning, and 4·6 in the evening. The next test, which presumably was the next day, or a day or two afterwards, was 2·8, exactly the same in the morning as before, but in the evening the butter fat had risen to 4·9, the solids not fat were reduced to 8·4, and the total solids were 13·3, and the specific gravity had gone down to 1029·1. That is for April. In May the first test showed 2·9 per cent. of butter fat in the morning and 4·6 in the evening; then it rises up to over 3, and only falls below 3 per cent. three times during the rest of the month. The average for the month works out at 3 per cent. of butter fat, 8·76 of solids not fat, and total solids 11·76, the specific gravity being 1032. That is the average for the morning's. The average for the evening's is 4·5 per cent. of butter fat, 8·7 of solids not fat, and 13·2 of total solids, with 1032 as the specific gravity. In the month of June there is only one day where the butter fat goes down below 3, when it reaches 2·8 per cent.; on all the other days it is over 3 in the morning, but in seven cases it is exactly 3 per cent. The solids not fat are pretty well the same; they are 8·5 and 8·6, except that on one morning, with the 3 per cent. of butter fat the solids not fat go down for some unexplained reason to 8·2, and, of course, the specific gravity is down to 1029·8, otherwise they are very even all through. In the evening all through they are 4·5, except one evening, when they are down to 3·9. In the month of July they are over 3 per cent. in every case except one; there is one day when they fell to 2·9 in the morning, otherwise they are over 3 per cent., and in the evening they are 4·5. In the month of September they are well over in every case, and in the evenings in two cases they go up to 5 per cent. The same thing applies to October, when the tests end. Now take the next year. This milk came from a different farm, but it was supplied also all through the year to the Dairy School.

4132. (*Mr. Barham.*) Is this 1899?—Yes. The other that I gave you was for 1898. In April there were six tests taken. In the first test in the morning's milk there was 2·9 per cent. of butter fat, 8·6 of solids not fat, showing total solids 11·5. In the evening there was 4 per cent. of butter fat, and 12·6 of total solids with a specific gravity of 1031·5—that being in each case the same. The next four tests are all I think over 3 per cent., and then there is one test during that month besides and the one I have read out to you which goes down to 2·8. The evening's milk, for some reason or other, was not tested on that day. In the month of May twelve tests were taken, and once it goes down in the morning to 2·9, once to 2·8, once to 2·7, and all the rest are 3 or over 3.

4133. How many are at 3?—There is one at 3·2, another at 4·1, and the others are 3·6, 3·0, 3·0, 3·1, 3·0, 3·1. The average for the month was 3·0—exactly the same as the average for April. The average total solids were 11·9, and 1032 was the average specific gravity. In the month of June the average is 3, with the exception of twice in the early part of the month, when it was 2·9, and the lowest total solids was 11·5. That seems to be the average, as I say, but once or twice they have gone up as high as 12. In the evening, in the month of April, there is an average of 4·1 of fat, and there is an average

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of 4 per cent. in the month of May, and 4·2 per cent. in the month of June; in July the average is 3·5, and in the month of August it is 3 per cent.

4134. That is the average of how many samples?—Of five samples; twice it is down to 2·9, and twice it is over 3·0. In the evening there was only one sample taken, and that was 4·2. In September, 1899, there were no samples taken in the evening, but there were two samples taken in the morning; one was 4 per cent. and the other 3·8. In October the average was 3·3, only once going down under 3 per cent. in the eleven samples. In November, with nine samples, the average was 3·2; it went down in no case below 3 per cent. In December it was 3·4. Those are all morning's milkings; in these last three months there was nothing taken in the evenings, as they only supplied once a day. In March this year there was milk taken from a dairy company, where the milk did not all come from any one farm. The morning's average was 3·2, and in no case did it come down below 3 per cent.; in the evening it was 4·35, and only in one case did it come down below 4 per cent. Then, to see whether there was anything unusual in the enormous difference between the morning and evening milk I had my own herd tested, and submitted to the public analyst. I had my Jerseys first and then my Shorthorns tested. I found out that the milk worked out rather extraordinarily.

4135. (*Chairman.*) Can you give us the figures, leaving out the Jerseys, please, because I think they are so exceptional?—I was only including them to show that the rule of the great variation in night and morning milk applies to the other breeds as well.

4136. We had rather excluded from our consideration all questions connected with Jersey and Guernsey cattle, because we know they are richer than others. Perhaps you had better present your figures in the manner you prefer?—I can leave the Jerseys out and go on with the others, if you like.

4137. I think we had better take the others if you please?—With the Shorthorns we had 4·2 per cent. of butter fat.

4138. (*Mr. Barham.*) Is that an average?—That is taking one cow's milk. I wanted to see, taking a cow fairly recently calved whether the difference was as great between the morning and the evening as was represented by these figures from the Dairy Company. I found that it gave 4·2 per cent. of butter fat in the evening, and 3·6 per cent. in the morning, but the specific gravity was 1034. The first remark of the Public Analyst when he tried it was, "This milk has been skimmed, and the same remark he made upon the Jersey milk; but when he tested it, and found butter fat in it—one had 5 per cent. of butter and the other had 3—of course he said it was an abnormally rich milk. The solids not fat were 9 in the evening, and they were 8·7 in the morning; the total solids were 13·2 in the evening and 12·3 in the morning. Then I took milk from two of my own tenants whose milk I had been in the habit of buying for a dairy factory; the fat of one was 3·9 per cent., with only 7·8 per cent. of solids not fat, making the total solids 11·7, and the specific gravity was only 1027·7. That was at night. The morning's milk with a specific gravity of 1029·2 had the butter fat at 3·6 the solids not fat at 8·1, and the total solids 11·7.

4139. (*Chairman.*) How many cows would that represent?—That would be about ten, I should think. The next farm would have rather more—possibly 14 cows. At night the specific gravity was 1031·35, the butter fat 4·2, and the solids not fat 8·7, making the total solids 12·7. In the morning the fat was 3·3, the solids not fat 8·7, and the total solids 12 per cent. With those figures before me it seemed to me that unless you tested a man's milk constantly, and got at an average, you might do a great injustice to a small man if his milk was tested on one particular day, and if he was prosecuted, because his milk came below a given standard, unless that standard is fixed at a very low figure. Then on the other hand, if you fix a very low standard it would tend to lower the standard of milk all over the country, which no doubt would be a great evil. I have found this, for instance, in my own herd—I was looking back just now. I have taken the number of pounds of milk which it has taken to make a pound of butter for the last 15 years; and I find that for 15 years it is the invariable rule that in the month of December I have made butter off less milk than I have in any other month in the year. That has been the rule for 15 years, so it cannot be an accident.

4140. Then from your experience do you think there ought to be no standard fixed at all?—I should be very sorry to say that. I have been advocating a standard all my life, and at the same time when I come to go into figures I cannot see where you are going to lay down a standard that will not do injustice to a small man. I think a man with a large herd ought to be able to keep his herd up to an average standard; but there is no doubt that a newly-calved cow gives less butter fat. Of course, in a cream gauge there is a certain amount of stuff that may look like cream which comes up, but the amount of butter fat is no doubt small in a cow which has recently calved; and the butter fat increases as the yield diminishes. I think milk ought to have 3 per cent. of butter fat, but if you fix the limit, and say 3 per cent. of butter fat shall be the legal standard you will deprive all these small men who own perhaps a couple of cows from selling their milk for the first two months after their cow calves, because I do not believe the average cow that the small dairyman has will give for two months after calving 3 per cent. of butter fat in the morning whatever it may do in the evening.

4141. Is it your experience that the general milk as supplied to public companies from the small dairymen is not a factor that you could almost really leave out of consideration?—I think on the small holdings there are numbers of people who supply their neighbours with milk. They do not go perhaps into the town, but keeping two or three cows they supply a few people with milk, and go round with it.

4142. Do you know many cases of that sort?—Yes.

4143. That do not send it into the town?—No; they send it round; perhaps they have got a cart, and many of them carry it in their hands, and sell it round to a few of the neighbours.

4144. You think they might be caught unfairly if a standard was fixed fairly high?—I think if you fix the standard at what I think it ought to be for milk—milk ought to have 3 per cent. of butter fat in it—then you would have caught this man I have instanced every time in the month of April; all through the month of April his milk could not have come up to the standard in the morning; but in the evening it comes well up to it. I do not think the public appreciate the enormous difference there is between the richness of the morning's and the evening's milk. Of course, the longer period there is between the evening's and the next morning's milkings the more that would be accentuated. People who bring milk into the towns milk their cows very early in the afternoon, and the period between the morning and evening milking is a short one, therefore their milk is much less, but is very much richer—you see in some cases here it is 70 per cent. richer. Then, again, I would say that where a man is prosecuted for selling milk below standard, as is done, I believe, sometimes, the inspector is sent to milk the man's cow, or to see the man's cow milked; but the inspector in nine cases out of ten will take the milk of the morning because he will see the milkman about, and have it analysed, and upon that the milkman may be prosecuted; but supposing the inspector goes out to a farm, and sees the cows milked, he will most probably go in the evening, because he will not go at 6 o'clock in the morning, he will go at half-past 3 in the evening, when it is the most convenient. Invariably in such a case you would find that rich milk is given in the evening. I think without knowing that, and if I had not gone into that, if a man was brought before me, and the inspector found that his cows gave 4·6 per cent. of butter fat, and he had been had up for selling milk about the town which only had 2·9, I would say there was proof positive that he had adulterated his milk, whereas it is the difference between the richness of the morning and the richness of the evening's milk.

4145. Personally yourself you would have no fear if a standard fairly high were fixed; you would be able to attain to it?—I have just given up my farm. I should not, but then I do not keep perhaps the class of cow that it would pay a dairyman to keep. I go in for making butter, and therefore I want a cow to give good rich milk. I know I have had some cows that do not give 3 per cent. of butter fat.

4146. There are individual cows of that sort, no doubt?—Yes, there are individual cows of that sort, and very paying cows too. I have had one or two cows that will give eleven hundred gallon of milk in the year; but they will not give for months after calving until they begin to dry up, 3 per cent. of butter fat. Of course, where you keep a large herd that mixed with a lot of other cows' milk brings it up to the average.

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4147. (*Professor Thorpe.*) I should like to ask you at what intervals these cows were milked—at what periods of the 24 hours?—I can tell you when my own were milked, but I cannot tell you when the others were. My own show 33 per cent. difference, and they would be milked at, say, 7 o'clock in the morning, when the men would finish milking, and at 5 o'clock in the evening. They would start about half-past 6 you know, or seven, and they would also start about half-past four; so I give it you as an average of 7 and 5.

4148. I ask the question, because I suppose it is within your knowledge that if the milking is distributed fairly evenly over the twenty-four hours there is not this wide disparity in the nature of the milk?—I should not think there would be. But you cannot very well do that, because a man wants to get his afternoon milk into the town, and the people want it for tea. We must milk early in the afternoon. Many cows of milkmen that take their milk into the towns are milked at 3 o'clock and before.

4149. We are quite aware, of course, of that fact, and I think we are quite aware generally of the facts that you have stated, namely, that there is a discrepancy between the morning and the evening milk, or the morning and the afternoon milk, but we are also informed that the degree of that discrepancy is very largely determined by the interval which has occurred between the two milkings?—Yes, I daresay it is.

4150. That being the case, you do not give us very much help when you rather incline to recommend—if I may gather that as the gist of your evidence—that we must regard in fixing the general average standard to the conditions of morning milk which may be determined, of course, by this very factor of a very unequal interval during the twenty-four hours between the milkings?—Yes; but unless you can mix the morning and evening milk you must regulate your pace by your slowest horse, and you must regulate the milk not by the richer but by the poorer.

4151. Not, perhaps, altogether so, because we have also had it in evidence that when the fact is more generally recognised of this great discrepancy between the morning and the evening milk, it might in a great many cases be possible for farmers to accommodate their periods of milking, and for communities even to accommodate themselves to the periods of milking, so as to get a more equable condition of things?—I do not think you could. In the present condition of the labour market you could not milk earlier in the morning, as the men would not come. It is very difficult to get your cows milked at all, particularly on Sundays. You are obliged to suit, to a certain extent, your customers, and also you have to regulate yourself as to your labourers; you are very much in their hands, and you would not be able to get your men earlier in the morning. Your men would not come, for instance, at half-past four in the morning to milk your cows.

4152. Nevertheless, you see, it is a serious matter to ask this Committee to practically depress—which would be the effect—the general average supply of milk in view of a low standard having to be fixed when you say yourself that if a low standard were fixed the inevitable tendency of that would be a great depreciation of the average milk supply?—Yes, I am afraid it would.

4153. Of course, we cannot afford to recommend that; therefore it means that some conditions must be secured to obviate that result?—Yes; but is it necessary to fix a standard at all?

4154. How are prosecutions to be conducted in the absence of a standard?—There are many things to be taken into consideration. You must take into consideration the specific gravity, and you must take the circumstances of the temperature. Analysts can nearly always tell us whether a milk has been tampered with or not.

4155. They can only draw an inference as to whether it has been tampered with from certain limits which they themselves have fixed as to the amount of fat and non-fatty solids and certain other analytical criteria which the milk produces on analysis; there is no other method of doing it?—You are going to jeopardise a very large industry.

4156. By doing what?—If you fix a standard which people are liable to get below. For instance, you get here an average through the month of 3 per cent. of butter-fat in the morning. That is going very near what you would say is the legal standard. You are just up to it, and that is all, in the morning. Occasionally, from some cause or other they drop below it—just every now and again; but 3 per cent. is the average.

4157. You are aware, I suppose, that for some considerable length of time past a 3 per cent. limit of fat has been the limit adopted at all events by a very large proportion of public analysts?—Yes; but they look for other circumstances. They say that, having got 3 per cent. of butter-fat, they look about for other elements.

4158. No; they fix their limit solely upon 3 per cent. of butter-fat, and 8·5 per cent. of solids not fat. You cannot tell this Committee that the milk supply of this country has been jeopardised because those limits have been in existence among the great body of public analysts for 15 years?—I think in the majority of cases I would myself fix it at 3 per cent. I would not buy milk myself that had not got 3 per cent. of butter-fat in it.

4159. Then why should the consumer?—It is a very difficult thing to say that no man shall sell milk which does not always have 3 per cent. of butter fat. Mind you, I say if that man only gives you under 3 per cent. on the average of the morning and evening milking, why you have a right to complain; but supposing he gives you 4·6 per cent. in the evening on his milk, then I do not think you have any right to complain.

4160. No, if we could so arrange matters that it was averaged in that way, I quite agree that we cannot ask for anything more?—I say on the average of twenty-four hours you ought to have 3 per cent. of butter fat, and milk that has not that is not worth much.

4161. Are you aware of the provisions of Section 4 of the new Act?—No, I do not think I am.

4162. Section 4 of the new Act reads thus:—"The Board of Agriculture may, after such inquiry as they deem necessary, make regulations for determining what deficiency in any of the normal constituents of genuine milk"—confining ourselves for the moment to milk—"shall for the purposes of the Sale of Food and Drugs Acts raise a presumption, until the contrary is proved, that the milk is not genuine." Now the person who has sold morning milk with an amount of fat possibly lower than such a limit as would be required by the Board of Agriculture or whose milk is the produce of one or two cows, is contemplated by these very words—shall "raise a presumption until the contrary is proved."—Yes.

4163. It is obviously open to that person to satisfy the Bench that that is the condition of things, and no doubt if the Bench were satisfied the presumption would be rebutted; is it not so?—Yes, in that way; but still you find that people do not like being prosecuted for an offence that they have not committed.

4164. They do not like being prosecuted; on the other hand we do not like drinking poor milk?—No. I say that the thing is very difficult. If you could take the average between the morning and the evening I am all with you to say that 3 per cent. is none too high.

4165. (*Major Craigie.*) Are you speaking at this moment as representing the Council of the Royal Agricultural Society, or are you merely giving an individual opinion?—I am nominated by the Royal Agricultural Society, but I specially stipulated that I was not going to represent anybody except my own opinions, and therefore it was decided by the Dairy Committee that I should give my own opinons, and that I should not bind anybody by them; so I do not bind the Committee of the Royal Agricultural Society by any opinion of my own.

4166. Might I ask whether on this point of the standard has there been any discussion among the Committee itself or in the Council of the Society?—There was a slight discussion. I was not there yesterday at the Dairy Committee, because I could not be up in London, but the month before there was a slight discussion. They did not go very deeply into it. I presented some of my figures, because they had previously asked me whether I would, but the time did not allow to go very fully into it. So, therefore, there was not a very exhaustive discussion upon it, I may say.

4167. There has been no resolution or pronouncement of the Society in any direction on this subject?—No, there has not.

4168. Neither now, nor at a former time, has the matter been under discussion?—No; I cannot remember any resolution having been passed by the Dairy Committee, or by the Council upon the question of milk standards.

4169. Has the matter come before the other Committee with which you are connected—the Technical Edu-

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cation Committee of Gloucestershire, in connection with the work of the dairy schools?—Yes; and I may say I had these figures made out for me from the books of our Dairy School; these were taken from the daily books.

4170. These, I understand, are the results?—Yes, the results.

4171. My question rather was, has the question of a standard been under discussion in Committee at all? You can, of course, quite understand that we are anxious here to discover what is the drift of opinion in the matter, and you are very well qualified to tell us whether in the county of Gloucestershire the matter has been under discussion?—The drift of the opinion of the Dairy Committee of Gloucestershire is that they do not see their way to recommend a standard. They cannot say at what point you should fix a legal standard, and they think that you might do a great injustice to the milk sellers if a standard was fixed. That is the opinion of one or two of the members who are on our Committee who are large milk sellers, and who represent large districts down Berkeley and Thornbury way, and down there. They are very much against a milk standard, and they are very much alarmed at the idea of fixing a standard.

4172. We might take it that there is a considerable body of opinion in favour of not establishing by regulation any standard whatever?—Yes, a very strong opinion.

4173. They would be satisfied with the position as it stands now?—Yes. It is a very unsatisfactory one, but at the same time they believe that the evil of a legal standard would be greater than the existing state of things.

4174. (*Dr. Voelcker.*) How many farms supplied the school of which you gave statistics for 1898 and 1899?—One farm.

4175. Only one farm?—It was a different farm in each year.

4176. The figures represent two individual farms then?—Yes, for those two years, and then for the third year there is a different one.

4177. Have these tests all been taken by the mechanical method?—Yes, by the Gerber, occasionally checked by the public analyst, who has taken samples and analysed them.

4178. The figures as to solids not fat have been by deduction from the Gerber test, I presume?—Yes, they have.

4179. What does the Dairy School use the milk for?—For making cheese and butter.

4180. Not for sale as milk in the town?—No.

4181. Among the cases that you gave to us you mentioned some decidedly low results; one case you mentioned showed 11·2 of total solids?—Yes.

4182. Three per cent. of fat being included in that?—Yes.

4183. Have you any proof that that was a genuine milk?—No, except that the specific gravity has dropped. You would know better than I do, but I take it that supposing that man had watered his milk he would have lowered his butter fat, but his butter fat is the same all through the month—it is 3 per cent. all through. If he had watered his milk all through from 1031, which is his average specific gravity, to 1029·8 he would surely have lowered the butter fat; if he had lowered the solids not fat by 2 he would have lowered the butter fat too.

4184. If he had watered the milk, and it had been richer than 3, he might very well have given 3 of fat and 8·2 of solids?—Why, unless he had done it every day, because his butter fat is all through the month 3 per cent.?

4185. Still you are not in a position to say that that was genuine?—No. The afternoon is well over 5. I think the presumption is that it was a genuine milk, unless it was all skimmed and watered every day.

4186. In the case of the milk from your tenant, there again there was one very abnormal result showing 7·8 of solids not fat, and 1027·7 specific gravity; that looks like an adulterated milk?—The butter fat is 3·9.

4187. And the solids not fat 7·8?—Yes, with a total of 11·7.

4188. You do not know under what circumstances that was taken?—That was taken at night, and the morning's milking shows 3·6 of butter fat. There is very little difference between the morning and the night milk.

4189. 3·9 is rather low compared with the samples you were getting about that time for evening milk, is it not?—No, I should look upon that as a fair sample for a shorthorned milk.

4190. The amount of solids not fat is very different to what you were getting in the other cases at that time, is it not?—No, I have not taken the milk that was supplied to me in that way, except that one time; I cannot give you the figure. This was taken in March.

4191. Then you cannot speak to the history of that particular sample?—No; excepting it was a milk that I had been getting from my tenant; I am perfectly certain it is a genuine milk.

4192. Your general belief is that that was genuine?—Yes.

4193. Can you give any reason for the Dairy Company which supplied the school giving milk which never fell below 3 per cent.?—I take it it is from a very much larger quantity.

4194. From mixed milk of a number of cows?—Yes—I beg your pardon, it did once go down to 2·8.

4195. The real difficulty that you conceive is that of meeting the case of the small man?—Yes.

4196. You would agree, I presume, that the milking strain can be improved by paying attention to it?—In what way?

4197. Do you not think that by paying more attention to the kind or the breed of cows that you get to the care of the cows, and to their feeding, that you can get a better strain of milking cattle?—I think the breed of cows has got a great deal to do with the milk.

4198. If you were to impose a higher standard than has been in existence so far you tell us that there would be no difficulty in the people who keep a number of cows keeping well up to it?—Your big milker is always a poor milker; one of your big cows that gives you a thousand gallons of milk is always deficient in butter fat.

4199. An individual animal you mean?—Yes; that individual animal is always deficient in buter fat.

4200. Do you not think that by paying more attention to the milking strain of cattle there would be no difficulty in getting all over the country a fairly high standard attained?—If you get a cow which gives you rather less milk the milk will no doubt be richer; the quantity and the quality very seldom go together.

4201. I put it to you generally in this way: Regarding the supply of milk to the public, is it not the case that if you have a low standard very little trouble would be taken to have cows which give milk any better than that, but if you have a high standard there will be no practical difficulty in reaching that standard, and the outcome of it would be an improvement in our milking strain of cattle through more attention being given to them?—I think it is very possible.

4202. Then, why should we legislate for the person who has two possibly inferior cows?—I do not know that they are inferior cows. A great number of Shorthorns directly after they calve will not give you 3 per cent. of butter fat.

4203. You hold that the low quality given in the morning is not the result of poor feeding or insufficient care, but is owing to natural causes?—Yes, I think it is owing to natural causes.

4204. Why does not that apply, then, in the case of your dairy company which sends the milk in?—Because this dairy company have got milk, no doubt, from many cows that have calved lately and some that have calved a very long time ago—stale milkers. A company probably which is getting milk from all round the country will have a number of stale cows sending milk.

4205. Turning your attention from the farmer himself to the public, why should the public be supplied with the milk of a cow which has recently calved when it has a right to expect a better general average?—Then, you mean to say that you would only allow large companies to sell milk who get their milk from a very large number of cows that they can mix all together?

4206. I am putting it to you whether, in justice to the public, they may not demand to have what you yourself acknowledge to be a good average supply rather than the milk of a single cow taken at a particular period?—I do not think you can shut out the person who has got an individual cow from selling milk.

4207. But you would acknowledge that if you take a standard fixed by that it would open the door to an immense amount of adulteration by dairy companies or others who get milk well above that quality?—Yes, I am afraid it would.

4208. Then with regard to the difference of the hours of milking you have told us that the small man, perhaps, milks at three in the afternoon?—Not only the small man, but the big man, too; if he is sending milk into the town round—thata is, ff he has got a milk walk—he must milk about three.

4209. It would be the case that with the small man of whom you say there are a number round Gloucester, who perhaps have two cows?—Yes.

4210. They start milking as early as three in the afternoon, and they will milk again in the morning about seven?—Yes.

4211. The morning's milk is higher after an interval of sixteen hours?—Yes.

4212. But there is only eight hours between the morning's and the afternoon's milkings?—Yes.

4213. In consequence of that long space of time the morning's milk is very poor?—Yes.

4214. Why should the public be the victim of the supply of milk, taken at an interval of 16 hours?—Some people milk three times a day you know, and there you get a much shorter interval.

4215. Still you would have us fix a standard, so as to meet the case of the man who allowed an interval of 16 hours to elapse between two milkings?—I do not see how you are to avoid it.

4216. Would you think it a hardship to say to that man that he ought to provide a better quality of milk?—I do not see how you are to avoid it, or how a man is to avoid having—perhaps not such a long interval as that, but having a very long interval. Take the winter; you cannot milk very early in the morning in the winter.

4217. It might point to an alteration of the system?—Numbers of people do not have their cows in at all, they have their cows out all the year round; supposing a man does that how can be milk his cows before 7 o'clock on a December morning? To begin with you cannot find them.

4218. If a man knows that milk taken at intervals of 16 hours gives something below 3 per cent. of fat he knows equally well that if he does not allow that 16 hours he will get something approaching nearer 3 per cent., or above 3 per cent.?—Yes, you will get a better average.

4219. Taking that in conjunction with the fact that if you put a low standard to meet the case of the poor morning's milk you admit a great deal of adulteration, would it not be very much better in the interest of the public as consumers that there should be something to compel some regularity in the milking, or that you should fix a standard which should provide for due care being paid to it?—I do not think it is practicable to say that there shall be an equal interval between the morning and evening's milkings, in practice it is impossible.

4220. Then if I have to take as the standard the quality which is yielded by any cow which has been standing 16 hours between the two milkings what are your views as to the question of the evening milk? Would you allow that to be adulterated down to the standard?—No, I would not at all, but of course there is a difficulty; unless you have an average between the morning and evening milk.

4221. Then if you take the averages of the morning's and evening's milk you admit that it would allow a great deal of adulteration unless you fix a high standard?—I think if you took the morning's and evening's milk you might fix a fairly high standard.

4222. How high a standard do you suggest—3·5?—You might take pretty well 3·5.

4223. And in any cases of doubt being thrown upon the milk leave the appeal to the cow?—Yes; but in appealing to the cow you must appeal to the same milking that the prosecution was taken upon.

4224. Then you would not allow a prosecution on a single milking?—No, I think it would be unfair.

4225. It surely would not be workable?—How do you mean?

4226. You could not work such a system as that in that way?—If you could ensure milk being constantly tested, if you could say to every milk-seller, "We will have enough inspectors to go inspecting and taking samples, say, once a week from everybody's milk around," then I say you might fix as high a standard as you like; but if you are going to take a sample once and again, and upon the only sample, perhaps, that a man has ever had tested, though he has been supplying milk for years, prosecute him, you may do a very great injustice; but you can have an average.

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4227. You have had some experience of cream, I believe?—Yes; but I have not got any statistics here about cream.

4228. You have no figures of analyses with regard to the cream you have supplied yourself?—No, I have not.

4229. Have you any views as to whether it would be possible to fix any standard, or whether any distinctions should be drawn between different kinds of cream?—There is an enormous difference in cream. I have always used a separator, and you can separate cream to almost anything.

4230. Thick or thin?—Thick or thin. The standard than I have gone upon is that if I buy cream I expect a quart of cream to make a pound of butter. In my own case. I always make a pound of butter from less than a quart of cream, but I have occasionally bought cream when I wanted it, and I always object if a quart of it does not make a pound of butter.

4231. You judge by the practical test?—Yes.

4232. Can you tell by the appearance at all?—The thin, you certainly tell by the thinness; the thin cream makes more butter in comparison than thick cream does.

4233. Would it be an advantage if a distinction were drawn, and, say, a certain percentage of fat fixed, or is it not called for, do you think?—I should hardly like to give an opinion upon that.

4234. What do you do with separated milk?—Feed it to calves and pigs.

4235. Is it all used on the farm?—It is all used on the farm.

4236. Is there much separated milk sent into Gloucester?—I do not think so; I tried at one time to sell a little separated milk, and I found that there was no demand for it, and so I did not pursue it.

4237. There was very little demand for it?—Very little.

4238. Is there much adulteration of milk going on in Gloucester?—I have no reason to suppose so. We very seldom have a case up before the bench. There was a case up before the Gloucester bench about a week ago, and I think that is the first case that there has been for a very long time.

4239. Your public analyst is kept pretty busy, I think?—We take a number of samples in the county, and if there is any reason to suspect, we order a special raid upon any particular thing; but I cannot remember that there has been much adulteration; in fact, I think I may say there has not.

4240. Have you any reason to think that separated milk is much mixed with other milk by way of adulteration?—No, I do not think that a great many people have got separators.

4241. Separators are not used very much?—I do not think they are used very largely.

4242. Would you draw, yourself, any distinction between hand skimmed milk and separated milk?—Of course hand skimmed milk is much richer than separated milk.

4243. Am I not right in thinking, too, that there is a great deal of difference in feeding calves, pigs, and other animals, on the one or the other; which would you prefer?—You can supplement foods which will make up for the deficiency in fat. Occasionally you find a calf which does not do upon separated milk, but it is only ocasionally. I always feed a certain amount of linseed with the separated milk.

4244. You would expect your hand-skimmed milk to be richer in fat?—Yes; with hand-skimmed milk probably they would do without any linseed cake.

4245. In the sale of those should any distinction be drawn do you think; when a person bought skimmed milk, meaning hand-skimmed milk, would he expect to get more fat in it than he would in milk separated by a machine?—I think he would expect to get more; I think separated milk should be sold as separated milk.

4246. Meaning thereby machine-separated milk?—Yes; because you get absolutely no fat at all if you have a good separator.

4247. People attach a different meaning to skimmed

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milk, and expect it to be richer than the separated milk?—Yes, I think they would do so. I know people who sell skimmed milk. A neighbour of mine sells skimmed milk, and they get a price for it which people would not give me for separated milk, because, for instance, separated milk is not very good for puddings and those sort of things; my cook says, "You cannot get a scum on it if you set it up for a week."

4248. You did not ever supply milk yourself into Gloucester, did you?—No, never.

4249. Have you found the necessity of adding preservatives to milk?—I have never used them in milk; I have with cream, but always I do it by request; I never put it in unless people ask for it.

4250. You would consider it inimical to the trade if you had any cream to say that you had used it?—No, because I never put it in unless people ask me for it; people ask me for it, and they say cream will not keep. If you do not put something in you cannot sell it; it is impossible to send cream away in certain weathers.

4251. (*Mr. Cowan.*) Are the dairies mostly small in the neighbourhood of Gloucester, or in Gloucestershire?—The farms, you mean?

4252. The dairy herds?—Yes, they are small.

4253. Those that send their supply into Gloucester would be very small dairy herds?—Yes. They come from a good distance; a good many come by train. They keep from 10 to 20 cows or something like that; there are no very large farms.

4254. I think you stated to Dr. Voelcker that you make the most of the produce of your cows into butter and cheese?—Yes.

4255. You stated also that you had had some cows in your possession that gave under 3 per cent.?—Yes.

4256. What did you do with those cows; did you part with them?—No, I did not; they gave such an enormous amount of milk, and a cow that gives 1,100 gallons of milk will make as much butter, though it will take more milk to do it, than a cow that gives a smaller amount.

4257. They would be more useful to the man who sends the produce into a town?—Yes, they would: it is a dairyman's cow, of course.

4258. Were the most of those tests that you put before us taken by the Gerber?—Yes.

4259. And you had some analysed?—I had some analysed by the Public Analyst.

4260. May I ask you if you found any difference between the results given by the Gerber and the result given by the Public Analyst?—Very little. For instance, the Gerber gave my Jerseys as 5 per cent. and the Public Analyst gave 5·3 per cent.

4261. (*Chairman.*) Do you know what process the analyst made use of?—No, I do not.

4262. It may have been the Gerber, too?—I do not know; it was a chemical test he made.

4263. (*Mr. Cowan.*) Have you compared the tests taken; have you had two or three different samples sent at the same time to different analysts?—No. These are taken every day by one of the teachers in the Dairy School; they take samples morning and evening; the milk supplied there is tested by the Gerber.

4264. Of course, you are showing a very great difference in the result of the morning's and of the evening's milkings?—Yes.

4265. But you allow, do you not, that if they were taken at equal periods there would be very little difference?—I should imagine so, but that I cannot tell you, because I have never tried a cow milked at a 12 hours' interval.

4266. Has it always been your experience that cows gave a poorer quality of milk for the first four or five weeks after calving?—Less butter fat certainly.

4267. Less butter fat?—Yes, but as their milk yield decreases the butter fat increases.

4268. Have you never found that cows absolutely give a better quality of milk immediately after calving than they do, say, four or five weeks after that?—They give more cream in the cream gauge directly after they calve, and then you will find that the cream will go down, but that is not butter fat.

4269. Do you think feeding has much influence in producing quantity and quality?—Quantity, yes; quality I do not believe in except in this way: If you turn a cow out in very cold weather, and feed it very badly, all the food that it gets will be wanted to keep the heat in its body, and it will not give you very much milk or rich milk; but if you keep the cow warm, and give it sufficient to make a well-balanced ration I do not believe that you can increase the quality of the milk by increasing the food.

4270. I think you agree that with a fair herd of cows there should be no difficulty in having an average of 3 per cent.?—No, I do not think there would be any difficulty.

4271. (*Mr. Murphy.*) An average of morning and evening milks?—Yes, mornings and evenings; I think with a herd of cows you ought to supply that, they would not all come in at the same time.

4272. (*Mr. Barham.*) I think your evidence has been of such a practical nature that really it is not necessary for me to ask you any questions, but I should just like to hear your further opinion with regard to what has been suggested to you, namely, that the farmers all over the country should be taught to milk their cows both morning and evening at a 12 hours' interval; do you think that would be practicable?—No, it is quite impracticable.

4273. Do you think the farmers would agree to it?—They would not do it; it is utterly impossible.

4274. Do you not think, too, that it is the duty of the producer to study his market as far as possible? We have been taught that with regard to the foreign butter being introduced and the foreigner catching the English market, because he studies the requirements; do you not think if the consumer wants warm milk the farmer should study the market, and if he can get a little more money for that milk by milking earlier, so as to get into the town and supply the public with warm milk in preference to cold milk, he should do so?—I do not think I quite follow you.

4275. I mean if a farmer finds that the consumer or the buyer requires or prefers to have the milk warm, do you not think he should comply with that as far as possible by milking the cows earlier than he otherwise would be inclined to do. Supposing in the afternoon the customers want warm milk for their tea, and it is necessary to milk his cows at two, do you think he should do it in preference to milking them at five, and delivering the milk the next morning, at least 12 hours old in the summer?—Naturally men who have milk walks do supply evening milk; they take it round about tea-time.

4276. In the county of Middlesex here it is the custom of dairy farmers who send their milk into the town of London or into the suburbs of London to milk very early—at 12 or one o'clock in the day, and send that out that same afternoon?—Then these men milk again in the evening and mix that milk with the morning milk and send it away so.

4277. It is not the custom in Middlesex to do it, though of course it is possible to do it, because they prefer to have their milk fresh and not to have the two milks mixed together; that is the practice, and as a rule when the milk is sold wholesale it realises as much as 1d. to 2d. a gallon more from the fact that it is warm milk and not railway milk. I take it that that appertains to Gloucester and to other towns. You are a practical man and have a very great experience of dairying and cow-keeping, having kept several herds of cows extending over a number of years. Now from your experience you say that it would be unsafe to fix a higher limit for butter fat than 3 per cent., and that even that would be a great injustice to owners of a few cows at certain seasons of the year?—Yes, if the morning's milk is taken.

4278. If cows were milked at twelve hours' interval, and their milk in each case gave 3·75 per cent. of fat; and if, on the other hand, cows were milked at an irregular interval, and the morning gave 3 per cent., the evening gave 4·5 per cent., making an average of 3·75, can you see how or in what way the public would suffer?—The public would not suffer at all unless the person only bought morning's milk. When I buy milk in a town once a day I would buy evening milk.

4279. Now, with regard to the heavy milkers, it has been the practice, I think, with dairy farmers of late to be encouraged to measure their cows' milk day by day, and to breed only from heavy milkers to improve the breed or the milking qualities of the cattle?—Yes.

4280. It has been suggested here, I think, that the milk of those heavy milkers should be eliminated, or that the cows themselves should be eliminated, and that the farmer should be taught to breed only those cows that

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give a higher quality of milk, although their quantity of milk may be smaller. Now, supposing a farmer has two or three heavy milking cows and they give poor milk, do you think he would for a moment consent to have them killed simply because they give poor milk?—No.

4281. Do you think it would be fair to call upon him to do so?—No, I do not think it would.

4282. Do you think it would be fair to call upon him to sell those cows, although in two or three weeks perhaps they would be diminishing their quantity of milk and would be increasing their butter fat?—No.

4283. Then, on the other hand, can we ask him not to sell that milk, but to make that milk into butter for six weeks or for two months, as long as the period of large milking and poor amount of butter fat continued; would it be fair to ask him to make the milk of those cows into butter, and would it be practicable?—I think it would be practicable in the case of a large herd to recommend a man not to have all his cows calving at the same time; and then you will not have this difficulty.

4284. But you would not suggest that he should keep a dairymaid ready to deal with those quantities of milk that might arise from cows not giving milk up to the standard?—No, I do not think that would be practicable.

4285. (*Chairman.*) I think your evidence was all rather the other way, showing that these big milkers are useful, as they give a quantity of poor milk which, mixed with rich milk, gives a higher average, and nobody suffers from that?—Yes. A member of the Committee suggested that I should not like to keep a cow giving 1,100 gallons of milk for butter making. I say that that cow will make as much butter as a cow that is only giving 400 gallons of milk, and perhaps 4·5 per cent. of butter fat—though it takes a great deal more of it to do it.

4286. In point of fact, you do, I have no doubt, as I do—we eliminate the cows that give a small quantity of milk, and we are rather inclined to chance the quality so long as we get quantity—at least, that is my practice?—Yes.

4287. In Gloucestershire, have you great difficulty in getting people to milk cows?—Yes, it is an increasing difficulty. You cannot get a woman to milk at all; the thing is unknown.

4288. In point of fact, the milkers, the people who milk the cows, now command the situation?—Yes, they do.

4289. And when it comes to be a question of saying, You shall milk at a certain time—the time I suggest—you have very great difficulty in getting them even to milk at all, let alone in fixing certain hours?—Yes, particularly on a Sunday.

Mr. JOHN DRYSDALE, called; and Examined.

Mr. J. Drysdale.

4290. (*Chairman.*) You come here to represent the Scottish Chamber of Agriculture, I believe?—Yes.

4291. Has the Scottish Chamber of Agriculture met in conclave to discuss this particular question?—I believe they have, but I was not present.

4292. Have they asked you to come here to put forward their collective views?—I was asked whether I would be willing to appear as a witness.

4293. To give your own private views?—On the assumption that I will approve of or agree to a standard of 3 per cent. or over. They asked me to appear as their witness on that assumption, and I said I should most emphatically support the contention, and I would endeavour to the best of my ability to prove my contention.

4294. On their behalf you represent that they consider 3 per cent. of butter-fat would be a proper legal standard?—Yes.

4295. You have been fifteen years manager, and are now part proprietor of the Fairfield Farming Company, and you farm something like 1,200 acres of land, your principal business being dairying?—Yes.

4296. You keep about 100 head of Ayrshire cows, and for fifteen years you have kept a careful bi-daily record of the milk?—Yes.

4297. You have frequently had tests made to ascertain the butter-fat it contained?—Yes.

4298. You have kept a careful daily statement of the quantity of milk passed through the cream separators, and you know how much milk it takes to produce a pound of butter?—Yes.

4299. You also buy milk from the surrounding farmers, and you keep a check of them to see that their milk is up to the standard?—Yes.

4300. You have taken care to breed only from cows whose milk contains a high percentage of butter-fat?—Yes.

4301. You go more by the quality than by the quantity?—Both quality and quantity. We came to the conclusion that that could be obtained by careful selection and careful breeding.

4302. Therefore, when you got a cow that did not come up to what you consider a good standard of milking qualities you drafted it, I suppose?—We drafted it out provided it was not milking under abnormal conditions.

4303. I suppose most people do who keep dairy herds. You are prepared to submit the figures of the tests taken under normal and abnormal conditions?—Yes.

4304. You have also acted as a judge at milking competitions when the milk is tested for butter-fat, and you have got some figures in regard to those competitions?—Yes.

4305. You have also gone into the question of feeding, and you will be able to give us some of your views on that point?—Yes.

4306. Can you give us the figures on which you have arrived at your opinions with regard to the quantity of butter-fat that should be in milk?—Yes.

4307. Other solids I understand you are not going to speak to?—I can give some figures upon those. I may explain, to begin with, that it was not with the object of an inquiry of this sort that we carried out our investigations; it was more for our own satisfaction as breeders. Our aim was to raise the average standard of the herd. With that object, after having selected the cows very carefully, we got Dr. Tatlock, a public analyst, to come out to the farm and stay, and make a very careful analytical examination of the samples of milk of the individual cows. For our purpose we grouped these cows, and I shall give you the figures for the groups and for each cow, and the figures for the total average. The figures I am going to give you are the average for the mornings and evening's milk in the first place; I can give you the figures for both morning and evening later on. At the time this test was made there were sixty-eight cows in the herd; nine of those averaged 5·37 of butter-fat; twenty-two averaged 4·69; fourteen averaged 4·21; and twenty-three averaged 3·55. I might explain that of that twenty-three there were a few that had aborted—we had a plague of abortion for a year or two—and of that twenty-three two only were below 3 per cent., and they had quite recently aborted; the figures in their case were 2·6 and 2·59. I may say that is the only occasion on which I have ever come across genuine milk that was below that figure, and this was the case of cows that had aborted very early in pregnancy. We tried different breeds of cows and different crosses, but ultimately we drifted solely into the Ayrshire cow; she suited our district and our climate better.

4308. Are you in Ayrshire?—I am in Stirlingshire. Then in the matter of breeding I say most emphatically we can raise the standard. I did not draft out the whole of those 23 because they were under 4 per cent. I kept a few of them for a further trial, and I found that they were not all so bad. As I have explained, there was abortion amongst a few of them. For the most part we drafted out all those who gave milk of a low per cent., and bred constantly from those showing a high average; and in using stud bulls we were very careful as to their breeding in that respect, too. I must say that I cannot bear out the contention of the previous witness that a large quantity of milk is necessarily a poor milk. Quite the contrary is my experience. It might be interesting if I gave you figures of the yearly milking of a number of those Ayrshire cows. I found the largest yield was that of a cow yielding 1,427 gallons in the course of the milking period —that covered fully a year; then I had another yielding 1,416 gallons, and another yielding 1,238 gallons. Now, these were all over 5 per cent. of butter fat. Then there were others yielding 1,198 gallons, 1,196 gallons, 1,178 gallons, 1,158 gallons, 1,139 gallons, 1,098 gallons, 1,069 gallons, 1,096 gallons, 1,045 gallons, and so on. I have

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several other figures until we come down to 600 gallons. We make it a point to keep nothing in the herd giving less than 600 gallons of milk during the milking period. We did not find that the very large milkers necessarily gave poor milk. Our object was the making of butter for the most part, and of course we were anxious to have a large quantity, but primarily to have rich milk. We made some tests in feeding, and we find that sometimes by a sudden change of food we increased the flow at the expense of the quality. We put six cows under a test. The milk at the beginning of the test contained 4·75 of butter fat, and at the close of the test, having substituted green Italian grass for hay, and adding 3 pounds of linseed meal for 2 pounds of crushed oats, we increased the flow very considerably, but the milk dropped down to 3·57 per cent. butter fat. That was the average of morning's and evening's milk again. Then in June, 1898, I had a further analysis made. I found—what was a very rare thing in our experience—that it was taking twenty-nine pounds of milk to produce a pound of butter. I sent a sample of the milk for analysis, and found that it contained only 3·45 of butter fat. These cows were being largely fed on brewers' grains and cut grass. The manager of the Dairy Supply Company of Edinburgh, to whom I sent samples for testing, said he had found for several weeks the milk very poor all over the country—all the samples he had got in at that time were so; and in this case he considered it quite a fair average. I have some figures here of milking competitions at cattle shows; but the conditions there are not quite normal; the animals are away from home, and they are a little put about sometimes. I find in a competition I judged at Ayr where the cows were milked strictly at 5 in the morning, and strictly at 5 in the afternoon—that the morning's milk showed 3·24 on the average of 18 cows, and the evening's milk 3·7.

4309. It would be interesting to know over how many days these experiments lasted?—Just one day.

4310. (*Dr. Voelcker.*) How long had the cows been in the yard?—About a couple of days.

4311. (*Professor Thorpe.*) Then the extreme difference between the morning and evening, when they were milked at equal intervals under those conditions, which were abnormal I admit, was from 0·24 to 0·7?—Yes. I have here some figures of milk taken on the 22nd March—milk drawn from seven different farms. I took the samples very carefully myself, and had them sent on to the Public Analyst in Dundee.

4312. (*Chairman.*) What is his name?—Macdougald. I may explain that since Martinmas last we are not keeping such a big herd of cows ourselves; I am keeping only 25 head now, and buying milk from a number of surrounding farmers. I was anxious to have fresh tests taken. No. 1 sample represents the evening milk of ten cows—water 85·75.

4313. We may leave the water out?—Total solids, 14·25; fat, 5·80; non-fatty solids, 8·45. No. 2 represents a herd of 12 cows.

4314. Also evening milk?—Yes, the whole of this is evening milk. Total solids, 13·95; fat, 5; non-fatty solids, 8·95. No. 3 represents a herd of ten cows—at any rate, only ten milking at the moment the test was made; the total solids were 13·94; the fat, 5·10; and the non-fatty solids, 8·84. The next represents a herd in which there are only nine cows milking at the moment; the total solids, 12·41; fat, 4; non-fatty solids, 8·41. No. 5 represents a herd of 14 cows; total solids, 13·40; fat, 4·30; non-fatty solids, 9·10. No. 6 represents a herd of 15 cows; total solids 12·19; fat, 3·65; non-fatty solids, 8·54 per cent.

4315. How many of these samples have you?—I have seven of them. No. 7 represents a herd of 18 cows, two-thirds of which were about from a fortnight to a month calved. The cows in question had been forced with a good deal of brewers' grains and other stimulating foods. The total solids, you will observe, in this case are only 11·98; the fat being 3·30, and the non-fatty solids 8·68. The average for the whole lot totals up to 4·45. Then the following morning I had the whole of that milk mixed very carefully and two samples drawn, and in both cases the result is 3·40 per cent. butter fat. I sent these to Mr. Smith, of the Dairy Supply Company, and I fancy he would just test them with the Gerber. Of course, in our case we were not so very anxious about testing for solids other than butter fat: our concern was to find that we were always having a good return out of the milk we were purchasing in the butter we were producing. Then we have kept very careful returns of the amount of milk it took to make a pound of butter. I made a test with our herd one night. On December 29th, 1898, I weighed and separated 1,196 gallons of evening's milk the cream from which weighed 86lbs., and on being matured and churned it yielded 50lbs. of good dry butter, or an average of 1lb. of butter to each $23\frac{9}{10}$ lbs. of milk. I have here figures extending over 15 years; I have taken the average for all the different months of the year of the quantities of milk required to produce a pound of butter during each month of each year. I have struck the averages; shall I give you that in detail?

4316. I do not know that you need, thanks?—I can put it roughly this way: that taking all the year round about $24\frac{11}{12}$ lbs. of milk will produce one pound of butter—that is the average of 15 years, taking it over the months' averages—it is just a fraction under 25lbs.

4317. (*Mr. Barham.*) I am not quite sure; are they Ayrshire cows?—All Ayrshires. You will observe that there is a sharp difference between the morning's milk and evening's milk in the last test I made; but I might explain that the farmers from whom I am getting milk during the winter months send their morning's milk in in the afternoon cold. I have been all along very strongly suspicious I do not get all the cream. I am more than suspicious that in buying milk we do not always get the whole product of the cow. I am of opinion that the cow is milked, and two or three pounds of milk left on her, and that the seller goes over those cows, and strips them, and retains that for butter making. In order to find out the real difference I made a test of which I have some figures here which will be interesting, I am sure. I had a cow yielding on an average 21lbs. of milk at the milking in the evening, and something like 24lbs. in the morning. This cow has rather small teats, and is a little tough to milk. I frequently have cows of that description not properly milked, but by keeping a milk register one can check it on the spot. I put an expert milker to milk this cow, and I told her to take 16lbs. of milk from her, and bring it to me, so that I might weigh it, and have a sample of it. I sent that sample on to be analysed, and the result was 2·30 per cent. of butter fat. I had the other 5lbs. taken from her, and a sample carefully drawn and that showed 5·70. Then I took another cow that was very free to milk, she was giving on an average about 18lbs. of milk in the evening. We had 15lbs. drawn from her, from which I took a sample, and that sample showed 3·40, the remaining 3lbs. showed 5·70. per cent. butter fat. Another which was rather difficult to milk yielding 15lbs. in the evening, I had 12lbs. drawn from her, and a sample taken of that yielded 2·50, while the balance of 3lbs. showed 5·30. I have no proof to offer that these practices are adopted, but I am perfectly convinced that they are; I am perfectly convinced that we do not get the full product of the cow; I am perfectly convinced that there are many farmers who retain all strippings to themselves which may in a large measure account for a great deal of the poor milk that is to be found in the market. Then I have the analyses of several samples of separated milk, but possibly you do not want that.

4318. (*Chairman.*) No, I do not think we need go into that. Perhaps you may be able to tell us about skimmed milk in replying to questions. Are those all the figures you wish to lay before the Committee?—That is all I think you would care to have.

4319. Have you no figures about the morning's milk as distinguished from the evening's milk?—I gave you the milk from individual dairies, which on being totalled up averaged 4·45.

4320. They were all evening's milk, were they not?—The same milk mixed the following morning I had analysed, and it showed 3·40.

4321. That was the morning's milk?—Yes.

4322. I did not want to interrupt you, but I did not quite gather that that was morning's milk?—Yes it was. I think I said I did not believe in getting that milk I was getting the benefit of the whole of the cream; I am perfectly sure I was not. I shall immediately be having the milk in warm every morning, and warm every evening, and I shall then have another test of it.

4323. Still 3·40 is a very good milk?—Yes.

4324. You say from the figures you have drawn out that 3 per cent. would be a perfectly safe standard to fix?—I should think it would.

4325. You heard the last witness when he said that the danger was that though the milk was so good in the evening it can be so bad in the morning, and if you take a sample of the morning's milk and test it you may run the risk of being very hard on a farmer who is really supplying genuine milk from the cow?—Yes, but I cannot follow his contention that it is impossible to divide the day equally. In Scotland we do divide it equally. I do not know what the practice is down south, of course, but we milk at 5 in the morning and at 5 in the afternoon.

4326. Where do you supply your milk to?—Largely to Glasgow and Edinburgh.

4327. Then the milk which is milked at 5 o'clock in the evening you cannot get down to the tea tables of Edinburgh and Glasgow that evening?—No.

4328. The last witness spoke of supplying the tea tables of the working classes?—I do not know so much of that class of business. Any milk I sell as whole milk is sold to public institutions. They get that in the morning, and it is morning's milk. The remainder of our milk is passed through the separator, and sold as separated milk, and the cream is converted into butter or sold as cream. So that I cannot speak from that point of view; we do not supply the people with their morning and evening milk as required for retail purposes.

4329. Yours is rather a special trade, I see?—Yes, it is a special trade.

4330. (*Mr. Murphy.*) If you had a small number of cows which gave a low quality of milk in the morning, and a better quality of milk in the evening, and you wanted to raise the standard in the morning to comply with some requirement, how would you go to work to do it?—I should assume they were being milked at very irregular intervals.

4331. That would be a point you would look into?—Yes.

4332. What else?—I would try and raise the standard of my cows, if I found their milk was very poor; I would try and improve that as any rational man can do by careful mating and careful breeding.

4333. It is within reason that a man with a small number of cows should materially improve his cows if they are giving a low standard of milk to bring the milk up to the standard of 3 per cent.?—He can, and I have informed all the farmers I do business with that they can have an opportunity of seeing our tests with that object in view.

4334. So that in your opinion it is practically under control?—Yes, and it can be helped by feeding—not to any large extent, but considerably; I do not say you can ever raise a 3 per cent. cow into a 5 per cent. cow by feeding, but you can affect her very considerably by judicious feeding.

4335. (*Mr. Barham.*) You say there is no difficulty in milking at regular intervals in Scotland?—We find no difficulty for the trade we do.

4336. Milking at 5 o'clock in the morning and 5 in the evening?—Yes.

4337. I suppose the men get to the byre by 4·30, do they—I suppose you muck out and feed the cows before you milk, do you?—We milk almost wholly with women in Scotland, with one or two men assisting; and the women are mostly located on the farm.

4338. With us, if I may be allowed to say so, it is totally different; here we milk with men, and if we adopted your practice the men would begin at half-past 4 in the morning, and would not have finished their work until 7 in the evening; you see what I mean?—I know.

4339. If you have to sit down to milk at 5 in the evening you cannot possibly finish milking and clearing up before 7?—I quite see.

4340. Women we cannot use here; your practice is to use the carters' wives and the cowmen's wives and daughters?—Just so.

4341. They just come in for an hour and a-half in the morning, and an hour and a-half in the evening?—Yes. We arrange to have married men with their wives and daughters who can assist us. There is one other point I want to bring out. Anyone who keeps a very careful milk register has it demonstrated to him that there is a very great advantage in milking cows at regular intervals; you get a very much better quality.

4342. (*Mr. Cowan.*) I think you have a very strong opinion that a good deal depends on a cow being properly milked out to the full quantity?—A great deal.

4343. Do you think that may account for the poor quality of a lot of the milk that is sent in to the towns?—I am quite convinced of it.

4344. You have been buying milk from several farmers you stated?—Yes.

4345. Of course, you do not like to say you are of opinion that you do not get the whole of the strippings?—When I find a difference of more than 1 per cent. between morning and evening milk I am convinced that there is something at fault.

4346. But then, do you not bargain for getting the whole produce of the cow?—Yes, I stipulate very carefully that I shall have the whole produce of those cows, except what the farmer may require for his own use, or that of his family.

4347. You are strongly of opinion that you have not been getting that?—Yes.

4348. Those that produce milk for sale regularly through the whole year could certainly get over the difference of the quality of the milk if they had their cows calving over the whole year?—Anyone with a large herd can usually arrange that; in fact it is judicious that he should have them calving at different seasons in order to keep up the quality of the milk used for butter making, or for selling as whole milk.

4349. Have you found that a poor man with a cow or two has cows that generally produce poor milk?—I have found a cottar with a cow that gave extraordinarily rich milk; but there may be a case of some poor body away in some remote Highland glen with a very old cow 12, 14, or 15 years, sometimes over 20 years old, and you will get poor milk in that case.

4350. There is no reason why a poor man's single cow should give poor milk, is there?—There is no earthly reason.

4351. Have you had much experience of separated milk?—I sell a good deal of it.

4352. To the towns, may I ask?—Yes, largely in Glasgow.

4353. Do you know what becomes of it when it gets into the towns?—No, I never inquire. I may say this much—that when collecting an account the other day from a Glasgow milk dealer he said, "They are going to legislate us out of the face of it; we shall not be able to buy your separated milk immediately."

4354. Do they distinguish between hand-skimmed milk and separated milk?—No. We had a case tried before the Sheriff in Paisley on that point I think.

4355. I think that case has been brought before us?—There was no distinction drawn in that. I invoice separated milk as skimmed milk. There is just a point occurs to me that the previous witness raised as to the value for calf rearing of skimmed milk and separated milk. I say most emphatically that there is no comparison. You can make an infinitely better calf with separated milk than with skimmed milk, notwithstanding the fact that you have more butter fat in the one than in the other, the reason being that in the case of the separated milk you have it nice and new, and fresh, and in the case of the skimmed milk, under ordinary circumstances, it has undergone considerable change. If you attempt to rear calves on skimmed milk, and nothing else, you have a wretched, scrubby, pot-bellied-looking calf, whereas if you rear calves with warm separated milk you can have nice lengthy, thrifty-looking animals. I have proved it to demonstration.

4356. There will not be much hand-skimmed milk coming into Glasgow now?—There is not much hand-skimmed milk now.

4357. Would you make a distinguishing mark between them?—I think that the whole object of skimming milk is to take away the fat. Everybody tries to take as much fat out of it as possible; the whole object is to take away the fat.

4358. They cannot take it out by hand-skimming?—That is their look-out; the object and intention is to take it out.

4359. (*Chairman.*) You say you invoice your separated milk as skimmed milk?—Yes.

4360. (*Mr. Cowan.*) Have you any experience about condensed milk?—None whatever.

4361. What is your experience in connection with cream; would you fix a standard for cream as well?—I think it would be very convenient if a standard were fixed, because we have a class of cream sold as "double cream," and we have ordinary cream, and it is very difficult to draw the line. We must keep giving the restaurateurs an exceedingly rich cream, and yet there is

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no satisfying them; they grumble straight on. They want it so rich that they can add a considerable quantity of milk and tone it down a bit, I suppose. I think it would be a great advantage if a standard were fixed.

4362. Could you suggest any minimum standard?—I am afraid I could not give the figures bearing on that.*

4363. (*Dr. Voelcker.*) You represent the Scottish Chamber of Agriculture, I understand?—Yes.

4364. And you are also engaged in business as a milk seller?—Yes.

4365. The Scottish Chamber of Agriculture includes a great number of farmers?—Yes, and there are a great many societies affiliated with it.

4366. In giving your views now, you are not speaking solely as a trader, but you are also considering the interests of the farmers who supply milk from their farms?—I am afraid I am rather representing my own views, because the Chamber thought I would be able to put forth views that might be agreeable to the general bulk of the farmers. I have never been consulted in the matter in any way whatever.

4367. What you have suggested is not at all out of regard to the farmers' interests as suppliers of milk?—What I have suggested is what I consider a fair thing.

4368. When you buy milk you say you keep a check on it as regards the butter fat; have you any standard yourself?—For a short time the check we were keeping was by means of these graduated test glasses, but I found afterwards that that was very unreliable. By having a daily statement that I drew up every day we were able to keep our fingers, as it were, on the pulse of the whole thing.

4369. Where do you get that daily statement from?—From the actual returns of the milk we handle.

4370. You mean the amount of butter produced from it?—Quite so; that was my only concern.

4371. Not chemical tests?—Not chemical tests.

4372. Then you are of opinion that you can breed for milk?—Emphatically.

4373. And you think that if attention be paid to it you could get a much better milking strain of cattle throughout the country?—Very much.

4374. When you speak of a better milking strain you do not mean to say simply the production of a bigger quantity of poor milk?—No.

4375. Your experience is—and I may say that mine is too—that the production of a big quantity of milk is not at all inconsistent with the production of a good quality of milk?—Quite the contrary.

4376. But you would agree with me that by the use of certain foods you may get the milk of a cow, which is a good milker, of an inferior quality?—Yes.

4377. And at the same time she will produce a very big quantity?—Quite so.

4378. But you would not call that ordinary good feeding?—No, it was rather forcing feeding. I think I gave figures to show that milk contained 2 per cent. more water when the cows were fed on forcing slopping foods.

4379. You do not see any reason for fixing a standard upon a forcing diet as against what you would call a proper feeding diet?—No, but even under a forcing diet I do not think we should come under 3 per cent.

4380. But the suggestion has been made. It has been said that the system of shows has had a deterrent influence on getting a good quality of milk; are you of that opinion?—I am of opinion that the effect of our shows in Scotland had not been in the direction of improving the dairy breed, and I have written very strongly for years and years on that point.

4381. Is it not the case that by the showing of cattle in a more or less fat condition even at a breeding show, a great deal of harm has been done, and the milking strain has to a great extent been lost?—In the case of Ayrshire cattle I am convinced that yearling and two year heifers that are forced for showing are absolutely ruined as dairy cattle afterwards, I have proved it.

4382. It is on such grounds that you hold with your experience that by paying attention to the proper selection of cattle you could quite well improve the quality of the milk?—I have advocated that point at cattle show dinners for the last five years, and I have put before these meetings figures showing where two cows might be standing in one stall, getting exactly the same feeding, being attended to in exactly the same way, and the one might yield a thousand gallons a year of 5 per cent. milk and the other 500 gallons of 2½ per cent. milk.

4383. Is there any publication in which this is contained?—I fancy it was reported in most of the agricultural papers.

4384. (*Chairman.*) You are speaking of the results of experiments you have conducted yourself?—Yes.

4385. They would be very useful, can you send them in, do you think?—The "Scottish Farmer" has a trick of laying hold of my manuscripts.

4386. The "Scottish Farmer" publishes all you say?—Yes, I think so.

4388. (*Dr. Voelcker.*) Anyhow, your experience is that by breeding from cows which are good dairy cattle you can very much improve the quality of the milk?—Very much.

4389. You do not think that that is necessarily confined to Ayrshire cows, but that it applies to the whole country?—I should think it does.

4390. And even in the case of a poor man with but two cows there is no reason for his having cows which are of this very low quality?—None whatever. I might explain that as a result of the advocacy that I have been driving at for years the Ayrshire Agricultural Association have taken the matter up very heartily. That is the show in Scotland, where we have the largest turn out of dairy cattle. Mr. Howatson, of Glenbuck, a public spirited gentleman, is this year offering a hundred guinea cup for competition at that show, where the animal's individual merits have to be taken into account, and also analyses of its milk and the quantity. He also is convinced that the quality of the dairy breed is being destroyed by showing merely for fancy points.

4391. What town do you belong to yourself; Fairfield, near Glasgow, is it not?—It is in Stirlingshire, not far from the town of Stirling.

4392. How do you, being a man of Glasgow, come to go to a man of Dundee?—Because I have come a good deal in contact with him of late. He has struck out a new line in this direction, and he is doing samples for us very reasonably, very cheaply—I preferred him from an economic point of view other things being equal, of course. He is analyst for a great many counties I might explain, and for a great many County Councils.

4393. He has made a good deal of stir in the dairy industry, I think, has he not?—I fancy he has.

4394. But financial reasons have been at the base of it?—No doubt.

4395. One does not go from Glasgow to Dundee for nothing?—He was so very good as to write to me, and send a whole lot of sample glasses, so I had no bother but to fill them up and send them off.

4396. With regard to separated milk; I do not want to raise any controversy on that point with you, but do I understand you to say that you can feed calves on separated milk alone?—Yes, I have done it.

4397. Ayrshire calves?—Ayrshire calves.

4398. I wish we could do it in this country?—I hold most emphatically—I am speaking of Ayrshires more particularly—that if you make your calves too fat, if you make your stirks too fat, and your two-year-olds too fat, you destroy them as dairy cows afterwards. I invariably use some of the calf meals in addition to separated milk.

4399. I wanted to know whether you had used the separated milk without any addition?—I have reared them without the addition of anything whatever.

4400. The experience in this part of the country, at all events, is that your calves will starve on separated milk?—They do not with us.

4401. (*Major Craigie.*) With reference to the hours of milking in Scotland, I think we may take it that the very old Scotch practice of milking three times a day is practically obsolete?—Almost, with the exception of these big milking cows. When they are newly calved it is almost a kindness to milk them three times a day for a little while just to relieve them when there is a big pressure of milk on, but in average practice three times a day is given up.

4402. Have you any records of the tests of milk that has been milked three times a day?—No, I have not that.

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* The witness subsequently wrote: "On reflection I would suggest 15 per cent. and 30 per cent. for ordinary and double cream." (*See* also *Q.* 4468.)

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4403. You have said there was no reason why you should not milk in Scotland at equal intervals; recently, within the last six months or so, has there been any difficulty in the labour question there—you are speaking of your experience over a considerable period?—Yes.

4404. Not with reference to the last six months?—There has been a gradually growing difficulty.

4405. It is a difficulty as to milkers?—In my own case, where I employ a good many hands I can arrange to have married men with their wives and daughters to assist, but in the case of the average farmer there has been a gradually growing difficulty in getting good milkers.

4406. Do those reside with the farmer, or do they come from a distance?—Do you mean in my own case, or on the average farm.

4407. In your own case first?—In my own case they are living on the farm.

4408. Now take the average farm?—They are mostly women hired for six months. At one time those were drafted from the best sources, from crofters, shepherds, and people of that sort you know. Now, I am sorry to say they are drafted from mining villages for the most part, and in their early years are neither taught obedience nor taught to work.

4409. Have you had any experience in using milking machines?—Yes, I have had a little. I conducted an examination on behalf of the Highland and Agricultural Society two or three years ago. They offered £50 as a premium for the best mechanical milking machine. In order to satisfy ourselves on the point we asked the inventors to give us the list of farms on which the different machines were to be found at work. We were not as this gentleman says, alarmed at getting up at 5 o'clock in the morning in order to have it decided; we did get up at 5 o'clock in the morning, and we conducted a very elaborate examination.

4410. Is it used to any very great extent now in the West and Midland Counties of Scotland?—I am afraid not quite so much as a few years ago. There are a few farmers in Ayrshire who stick to the Murchland machine. From March onwards they find the machines useful when the cows are in full milk, but I rather think in October and November, when the cows are long calved, and there is no great pressure of milk, that they rather discard the machine.

4411. You do not know many cases where the milking machine would be employed, where the product is to be sold in towns for consumption as milk?—Yes, there are some cases.

4412. With reference to the arrangements that are made for sending milk from your district, you spoke of selling a good deal of your own to public institutions; that would be arranged for by contract, I suppose?—Yes, by contract.

4413. In those contracts is it usual to stipulate for a particular standard?—In our case it never has been stipulated; they are so satisfied with what they are getting that they continue to buy it from us.

4414. In the majority of those contracts for public institutions in Scotland there are such stipulations, are there not?—I know perhaps in some of the Glasgow institutions there are stipulations, but such institutions we cannot do with; we are not in a position to deliver straight to the consumer from the train.

4415. In dealing with large companies for distributing in towns do not the contracts usually contain stipulations of that kind as to the standard?—I am not aware.

4416. I think you answered Mr. Cowan on the subject that you were in favour of having a standard for cream?—I think it would be a distinct advantage.

4417. Did I understand that to be a single standard for cream or more than one?—More than one; we must have more than one.

4418. You would have different grades of cream?—Yes.

4419. Have you ever had the subject of selling milk in different grades suggested or discussed?—No.

4420. With different values according to the percentage of fat?—It has not come under my personal notice, but I have heard of a milk dealer sending out two or three grades of milk.

4421. And charging different prices?—Yes. He would add a certain percentage of separated milk to sweet milk, and he would call that babies' milk, to be sold at so much; then a larger percentage of separated milk would be added and sold as ordinary milk.

4422. (*Dr. Voelcker.*) What was the second grade?—The first was special milk—babies' milk.

4423. The next was what?—Just the ordinary milk in ordinary use. I am told by the trade in Glasgow that in working class districts they have to sell cheaply and to give big measure; and they pretend they can only do that by reducing the quality. That, of course, is hearsay evidence.

4424. (*Major Craigie.*) The Scottish Chamber of Agriculture is made up, I suppose, of farmers who are not in the majority dairy farmers; I suppose a large portion of the actual attendants at the Board meetings are not dairy farmers?—The directors are largely men who are not dairy farmers, possibly with the exception of Mr. Speir, of Newton, who has been here already, I think; but there are agricultural societies affiliated with it from the West of Scotland which are almost wholly composed of dairy farmers.

4425. Do you know whether these smaller societies who are affiliated to you, and who are represented at the annual meetings, have considered and discussed the question of a standard at all?—I could not say.

4426. You have not a series of resolutions that you could put in?—Nothing has been put into my hands.

4427. Is there any formal resolution passed by the Scottish Chamber itself that you could put into this Committee?—I presume there is.

4428. But you have not it with you?—I have not got it with me.

4429. The Scottish Chamber have passed a resolution on the subject of the standard?—Yes.

4430. (*Mr. Cowan.*) They only resolved that their representative should go in for the 3 per cent.?—Yes. The letter I got was to the effect that I had been unanimously nominated as a witness for the Chamber on the assumption that I would represent that view.

4431. (*Mr. Barham.*) And that view was 3 per cent. of butter fat?—Three per cent.; had I not been able to agree to that view, of course, I would have wired them that I could not have appeared as a witness.

4432. (*Professor Thorpe.*) The resolution was 3 per cent.?—Three per cent.

4433. Not more and not less?—Three per cent.

4434. It was to be hard and fast at 3 per cent.?—Not less than 3.

4435. What was the exact resolution?—I did not get a copy of it; the secretary first wired me, and then he followed that up with a letter.

4436. It was not to be less than 3 per cent.?—I had not been able to attend any of their Edinburgh meetings; I had been ill for three months with pneumonia.

4437. It has been represented to us in evidence that occasionally difficulty arises in districts around Glasgow from the circumstance that it may happen, owing to the exigencies of the trade, that the milk from comparatively poor cows may all get into one churn, and it is generally speaking, impossible to so arrange matters as to supply the average product of the herd; do you bear that out?—I cannot see where it is impossible.

4438. Do you think the milk supplier might so arrange matters as to give a fair approximation to the average condition of the herd?—I see nothing to hinder him. I know that in supplying public institutions I make it a point to see that they have the milk of young cows three and four years old, mixed with the milk of aged cows in different stages of lactation—a fair average.

4439. Have you any difficulty with the railway companies in regard to any possible alteration in the character of your milk as it is sent out?—As affecting its character?

4440. I mean have you any reason to believe that the churns are tampered with; do you lock your churns, in the first instance?—Not in the case of separated milk.

4441. But in the case of whole milk?—In the case of whole milk and cream I seal them.

4442. Then, that difficulty with the railway company does not arise in your case?—I have had occasional cases of tampering with cream.

4443. You do not find the railway company raise any difficulty through not seeing into the churns?—No.

4444. Have you any general observations to offer to the

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Committee apart from the question of the standards upon the working of the Food and Drugs Act as regards milk?—I heard the previous witness; I think a point was raised about the use of preservatives.

4445. Apart from that; I mean as to the conditions under which samples should be taken and the conditions under which the appeal to the cow should be made. Have you any observations of a general character on these points to offer to us?—Before anyone was prosecuted I think it would be a fair thing that the authorities should take an opportunity of examining a fair sample from the milk of his herd to see how the fair sample so taken compared with the sample taken by the inspector.

4446. But before any imputation was made upon the milk some time must elapse after the sample had been taken?—Quite so.

4447. That difference of time might altogether alter the conditions?—Yes, it might.

4448. And invalidate, therefore, the appeal to the cow?—It might.

4449. Have you any suggestion how that difficulty could be overtaken?—I know there is a difficulty in the case of the retailer, because if milk is set a considerable time the globules of fat rise to the top very rapidly, and you might get a bottom sample that was very poor.

4450. I suppose, however, it would be open to a person brought into the police-court to explain the conditions under which the milk had been taken and at what period of the day it had been taken out of the vessel?—Yes.

4451. And that would be brought out in evidence, or might be brought out in evidence, might it not?—I think no inspector should take a sample for the purposes of prosecution unless he was satisfied that he was getting a fair sample of the consignment of milk.

4452. Perhaps you have not had any experience, but are you able to tell us whether the inspectors as a class do try to take fair samples?—I am afraid not, sometimes.

4453. Now, why?—Because they may take a sample sometimes when half of that particular consignment has been sold, and the retailer is at the mercy of his servants, who may or may not see that the milk is always thoroughly well mixed.

4454. I suppose in many cases the inspector does not take the sample himself; he employs somebody to take it for him?—He may.

4455. He employs somebody who simulates the ordinary purchaser to buy it?—Yes. I think I would rather prefer that the inspector took it himself and that he was careful to see that he got a fair sample of that particular full consignment. It is not fair to take a sample of a portion of a consignment.

4456. Is not the person buying the milk supposed to be by the vendor of the milk in the position of an ordinary purchaser?—Quite so.

4457. That purchaser is buying what would be sold in the ordinary course of trade over the counter?—Yes.

4458. Where is the hardship?—The vendor is at the mercy of his servants, who may or may not see that the milk is kept thoroughly stirred and thoroughly well mixed. It is quite possible for a purchaser to get an individual poor sample from a particular consignment of milk. It all depends upon whether it has been carefully handled.

4459. It is no reflection on the inspector that he does not take a fair sample when what he is doing is simply taking such a sample as would be delivered to him in the ordinary course of trade?—His object is to see that the average purchaser is getting value for his money and getting a fair article.

4460. I come again to that point. Does not the way he goes to work succeed in doing that?—You can quite understand that it is possible to get a very poor sample from a particular consignment.

4461. He only gets a sample which is sold in the ordinary course of the trade?—Here is a vessel containing 10 or 15 gallons of milk; supposing 10 gallons has been sold before the sample the inspector gets has been drawn, he may get a very poor sample.

4462. (*Chairman.*) So does the purchaser?—Yes.

4463. (*Professor Thorpe.*) He gets such a sample as would be sold in the ordinary course of trade?—Quite so.

4464. Has the vendor, therefore, any real grievance against the inspector?—I should not think so.

4465. (*Chairman.*) His grievance would lie against his own servant to let such a state of circumstances arise?—Quite so.

4466. Therefore he cannot complain if he suffers. Major Craigie was asking just now as regards the position of the Scottish Chamber; the letter which has been sent to us on the point says: "Mr. Drysdale will be prepared to give evidence in favour of the standard being not less than 3 per cent. of butter fat in milk and 15 per cent. of butter fat in cream"?—I never stated anything about cream.

4467. That was the letter we received; you do not make any definite statement as regards cream?—I am strongly of opinion that we should have a standard for cream as well, but I am not prepared to give any figures.

4468. You are not prepared to say 15 or 30?—No. [*See note on* p. 144.]

4469. (*Mr. Murphy.*) Do you think that if a standard of 3 per cent. were fixed for butter fat in milk it would be proper to allow an interval to elapse between that standard being announced and proceedings being instituted in connection with it?—That is to say if we enacted to-day that the standard must be 3 per cent., should you proceed to-morrow morning, and have prosecutions?

4470. Yes; or would it be proper to wait six months, or a year, to enable the small cow-keepers to provide for it?—I think there should be due notice.

4471. Would you make any suggestions as to the interval which should elapse?—A reasonable time should be given. If it is the case as alleged that milk is toned down to a particular standard it would be very unfair to pounce upon people without due notice.

4472. Would your experience of dairy farming lead you to make any suggestion as to how long the interval should be, taking things as they are, and taking things as they should be?—There should be three to six months' notice to be fair, I think.

EIGHTH DAY.

Thursday, 5th April, 1900.

PRESENT:

Lord WENLOCK, G.C.S.I., G.C.I.E. (*Chairman*).

Mr. GEORGE BARHAM.
Mr. GEORGE COWAN.
Major PATRICK GEORGE CRAIGIE.
Mr. SHIRLEY F. MURPHY.
Professor T. E. THORPE, F.R.S.
Dr. J. AUGUSTUS VOELCKER.

Mr. R. HENRY REW, *Secretary*.

Mr. ALFRED HENRY ALLEN, called; and Examined.

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4473. (*Professor Thorpe.*) You are a Fellow of the Institute of Chemistry and a Fellow of the Chemical Society I believe?—I am.

4474. You are Public Analyst for the City of Sheffield, and you have held that position since the passing of the Adulteration Act, 1872?—Yes, I was appointed in 1873.

4475. You are also Public Analyst for the West Riding of Yorkshire?—Yes.

4476. And for the Boroughs of Barnsley, Chesterfield, Doncaster and Rotherham?—That is so.

4477. You were president of the Society of Public Analysts in 1887 and 1888?—Yes.

4478. And you are the author of a work on commercial organic chemistry?—Yes, in six volumes. "Commercial Organic Analysis," is the title of it.

4479. Is it your experience that the Adulteration Acts are fairly thoroughly worked in Sheffield and the West Riding, especially in regard to milk?—Yes, that is so. I think we might have more samples in Sheffield than are taken, but still on the whole they work very fairly.

4480. What is the number of samples of milk received from the inspectors for Sheffield during the past three years?—They average 152.

4481. From the West Riding what is the average during the same time?—688 is the average during the three years.

4482. (*Chairman.*) Have you the figures showing the results of those analyses?—No, I have not; it would have involved a good deal of labour, and I did not know it was necessary. I could prepare statistics if you desire it.

4483. You might tell us shortly whether they prove that much adulteration exists or not?—Yes, there is a good deal of adulteration.

4484. (*Professor Thorpe.*) Those samples, however, which were taken by your inspectors would be taken on the prima facie ground that they were adulterated, would they not?—No; I am afraid that there is a great deal of haphazard taking. In the City of Sheffield they do watch certain men—men who have been found out before, and who are therefore open to suspicion; but in the country districts in the West Riding I think it is done in a very haphazard fashion. I may say that the West Riding—which, of course, is a very large district—has nine inspectors of weights and measures, who with their assistants are deputed to take samples of milk, among other things, from time to time. Also the West Riding County Council have encouraged the different Rural District Councils to purchase samples of milk, and they repay them the cost of the purchase, and they furnish legal assistance when cases go into court, paying the analyst's fee and giving them every facility. The result is that there are a large number of authorities—if I say 80 or 90 I think I am not exceeding the mark—from all of whom I am liable to receive samples of milk. Sometimes a zealous inspector thinks he will get half-a-dozen, and he is probably as well known as the village pump. At the same time he does purchase those samples, and they are submitted to me, and occasionally they are found to be adulterated. I do not think they represent suspicious samples at all. I think they simply represent the village supply as supplied to that particular inspector.

4485. Then they may be considered as average samples?—I suppose you can take them as average samples unless it is that the inspector is less likely to get an adulterated sample than an ordinary purchaser; at any rate, he is generally known when he purchases. Though, of course, they cannot legally refuse to sell. Occasionally we have what amounts to a refusal—a tin is upset "accidentally" in the presence of the inspector, and incidents of that sort occur.

4486. Would you kindly tell the Committee what are the methods of analysis which you make use of?—I really only can speak generally on the methods employed by other analysts. I ascertain the amount of total solids in the milk by evaporation of a weighed quantity of the milk. I ascertain the fat by an improvement or modification of the Werner-Schmidt process, by which I do not take off an aliquot part of the ethereal layer, but I remove it entirely. I shake it up again once or twice over with ether to remove any fat not previously extracted. Then that ethereal solution is evaporated to dryness, and in the case of ordinary samples I regard the residue as pure fat. In the case of condensed milk, it must be purified. If it is purified by treatment with petroleum spirit any matters which have been dissolved by the ether, but which are not strictly fat are removed, and you get a correction. But for ordinary purposes I am content with the ether—residue obtained in the manner I have indicated; that is for the fat. The non-fatty solids are obtained by subtracting the fat from the total solids.

4487. What steps do you take to assure yourself that the weight of the total solids is the accurate weight; I mean how do you assure yourself that the matter is thoroughly dried?—It is dried for six hours as a matter of course; first of all dried up for three hours over an open water bath, and then for three hours in the water oven, and then it is weighed until constant. We find in practice that six hours is sufficient, but as a precaution it is always weighed twice.

4488. You say in your proof that if the method of analysis employed is liable to effect imperfect abstraction of fat, the limit ought logically to be lowered?—Yes.

4489. That is what we may call the limit of fat by which the presumption is raised as to adulteration or abstraction?—Yes. I am afraid my explanation is cut short in the proof, but that is what I meant—that in other words before we fix limits—I understand this Committee contemplates possibly fixing certain limits?

4490. (*Chairman.*) We have not the power of fixing, we can only recommend?—I beg your pardon; you contemplate recommending certain limits for the composition of milk and those necessarily must depend upon the method employed. Assume a strictly accurate method then we should all agree; assume that there is a variation in the method employed, as for instance it is within our knowledge that there used to be by the old Wanklyn system, which did not extract the fat completely—that of course affects the question. In former days public analysts actually adopted as the minimum limit of fat in milk 2·5 per cent. because the fat was then extracted by a process which did not remove the whole of the fat from the solids; but when a more perfect method of fat determination and extraction was devised, then they thought it was only right and proper to raise the limit, and they did so to 3 per cent.

4491. (*Professor Thorpe.*) Now does not that explanation incidentally imply that if limits are prescribed by the Board of Agriculture the method of deducing those limits should also be prescribed?—If we admit that the method is accurate, and that it gives accurate results I do not know why we should be limited to a particular plan of obtaining that; for instance, assuming that we have half a dozen methods of accurately determining the fat in milk I do not see why the analyst should be tied down to the use of any one of those, which largely reduces him to the position of a machine.

4492. Do you wish to advise the Committee that our methods for the determination of these limits, say fat and non-fatty solids, are now so sufficiently accurate that all analysts may be practically compelled to use them?—I should be very pleased if other people were compelled to use my methods, but I object to be compelled to use other people's methods; in other words I claim a certain independence so long as my results are accurate as to the way in which I get them. I do not think it is right for us to recommend methods at present. I should be very glad to think that the time will come when by consultation between those interested we could arrive at a definite method of detecting adulteration. I do not think we are bound always to take the solids not fat as the only criterion of adulteration by water. Certainly the fat is the only criterion of the removal of fat; that is a simpler question, and perhaps if we were to confine ourselves to that for the moment it would be better. What I should not like to see would be definitely prescribed methods at this stage, because I am afraid they would get crystallized, and any improvement in method based on a fresh principle would have very little chance of being considered in the future. We know how difficult it is to alter Acts of Parliament; we have been striving for twenty years to get a better Act than the old Sale of Food and Drugs Act, and we know how long it was discussed in Parliament, and how long it has taken to get through the House. That being the case, it being so difficult to alter by legislation, I should be very sorry to see the Legislature lay down methods of analyses unless they were capable of improvement, alteration, or reconsideration at short intervals.

4493. That is quite compatible with the powers of the Board of Agriculture—I mean there is nothing in the nature of an Act of Parliament calculated to prescribe these limits?—No.

4494. It is a mere regulation of the Board of Agriculture which may be altered from time to time on good cause shown?—Yes. But I am not quite certain how that applies in Government Departments—you know better than I do. My own feeling is that Government Departments are sometimes very difficult to approach, and still more difficult to move. I do not think the time is ripe for laying down a method of analysis. We can lay down the principle that the fat must be up to a certain amount, whatever we decide on or think desirable; but to go and say that the fat must be determined by a certain process I do not think we are ripe for. It must be done after due consideration and consultation with those concerned.

4495. May I point out that the difficulty arises in this

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way? We have had it in evidence before this Committee that a method such as you are alluding to, the Wanklyn method, is already used by some analysts, who make deductions of course on the assumption, which never comes out, that the whole of the fat is extracted. Now, therefore, if evidence is brought before a court based upon a particular method, and that has to be confronted with other evidence based upon an entirely different method, one is not helping the Bench to a decision, because they are not necessarily aware of the disparity between the results of the different methods?—No, that is the case, and it has caused a failure of justice in the past there is no doubt with disagreeable friction.

4496. That is the point; of course I am only driving at the removal of that particular difficulty?—If it can be done in the future I think it would be eminently desirable, but I do not think it is right to do it yet until there has been a very systematic and thorough consideration of the possibilities in that way. I do not like that the Board of Agriculture should at this stage think itself prepared to recommend methods of analysis which I am afraid would, therefore, admit of no improvement in the future. I think any recommendation of the sort should be the result of careful conference between the chemist at the head of the Government Laboratory and certain typical public analysts, as I believe is actually being done in the case of butter.

4497. If that were done would you be prepared to suggest to the Board of Agriculture to prescribe official methods?—Again, I say I prefer my own working, my own methods, to others. I have no doubt the methods which they would prescribe would be very excellent and accurate; but I should not like to have to go into court and be asked "Now, then, did you use the official method, Mr. Allen." "No, I did not, but I used one that gives exactly similar results." "Ah, but you did not use the official method." See how we are placed in respect to the British Pharmacopœia. There are methods there which are more or less satisfactory—very often less. But if we were to be tied to estimating, say, the morphia in opium to the pharmacopœial method, and because we had not a sufficient quantity of the sample we used a half quantity, and then we were to be told that we had not adhered to the official method, it would be a very serious matter. As an instance in point, I remember Mr. Bannister telling me that he did not think public analysts had any right to determine the specific gravity of spirits, except by a Sikes's hydrometer; and if it came out in court that a Sikes's hydrometer had not been used he thought they would lose their case, because Sikes's hydrometer was the official instrument used for determining the strength of the spirit by the Excise—for an entirely different purpose to adulteration. Mr. Bannister held, therefore, that we had no right to employ any other method in ascertaining the specific gravity for the purposes of the Adulteration Acts. If the court were to hold that we had no right to modify in any sense or way the processes laid down by the Board of Agriculture, well, the life of a public analyst would be an unhappy one.

4498. (*Chairman.*) While on this subject might I ask you this: Would it be possible for the Board of Agriculture to lay down that certain methods should not be used?—There I am very much with you. I think you might with great advantage improve it that way by cutting away the bad methods.

4499. And they are known?—Yes, some of them certainly are known.

4500. In that case possibly the object might be attained?—Yes; I think there are some that might be ruled out absolutely, and with advantage.

4501. (*Professor Thorpe.*) But looking at the matter departmentally, do you not think you put a Department in an invidious position when you actually call upon it to stigmatise certain methods associated with certain gentlemen's names?—Well, do not you think it is a question of the survival of the fittest—that the methods which would really give you accurate results would be those which would really survive. If the others are still lingering on they are moribund, and I do not think we need trouble very much about them.

4502. Pardon me, they are not moribund; they are continually brought up, and they do lead to those miscarriages of justice, and certainly to those occasions of friction to which you refer. If we are to prescribe standards do you not see that we might also have to prescribe methods. I do not say any particular method; it may be a certain range of methods?—I am thinking all the time of fat in order to simplify it, because when we come to take the solids not fat or the question of watering the milk I have got something else to say. I am thinking all the time of methods for fat—I am limiting our talk to fat for the moment.

4503. Do you not see a great practical advantage in the interests of justice, and in the interests of the smooth working of the Act if, I will not say one method, but a certain range of mehods, it may be, were prescribed, by which all analysts are agreed that substantial accuracy can be obtained?—I must agree with you thoroughly there. If we could have a choice of accurate methods that would be very proper; I do not like one. If a man invents a new method—it may be anybody may invent a new method—which he satisfies himself, and is prepared to swear it—gives identical results with those which have already become official I do not know why I should be precluded from using it. You put a very great restraint upon future industry and ingenuity if you say to a man, "Oh, no; we have arrived at an ultimatum; we cannot do anything better, therefore it is no use your trying to do it."

4504. I think that you are taking a rather limited view of the progressiveness of a public Department when you suppose there will be that cast-iron rigidity about their procedure?—First of all it has got to be brought to them as a prominent matter. It is very right that they should not be bothered every month with a man who thinks he has discovered a new method, or a new improvement; but a time does come when improvements are made. As a pioneer myself I have felt very sore sometimes that my pioneer methods had not been perhaps recognised as they might have been.

4505. Anyhow, the Committee gathers from you that you are not prepared to recommend certainly any one method, but, with the qualifications that you have given, you think the subject of certain methods being suggested—I will not say even prescribed, but suggested—by the Board of Agriculture is worthy of consideration?—I think it is, after due conference with those concerned.

4506. That, of course, would be done. Now is it your experience that the limit which is generally adopted now of 3 per cent. of fat does permit of a considerable amount of skimming, or abstraction of fat?—Yes, it must do. In the first place, I believe that the milks which are genuine, which pass through my hands, very rarely contain less than 3·5 per cent. of fat, and they are very frequently up to 4 per cent. This last autumn, when the farmers were all complaining that the weather prevented the cows from giving normal milk they had more fat in than ever I had seen before. Going through hundreds of them I found they had generally high fats last autumn—very often up to 4 per cent. If a milk contains 4 per cent. before you bring it down to 3 per cent., of course you can dilute it with one-third of absolutely fatless milk—of separated milk. That is an enormous possibility. A practice which is very common in the neighbourhood of Sheffield is for a farmer to bring into the town a supply to a milk distributor, and that same milk distributor gets, by railway from a country district, separated milk, and he mixes the two together, and sells them.

4507. You know that goes on?—As a daily practice.

4508. To your own knowledge?—I know it from my inspectors; personally I do not go and see the man. It is within my official knowledge.

4509. Are you prepared to recommend to the Committee to what extent the limit of fat might be raised without any injustice?—Yes. I think the limit of 3 per cent. for fat permits an enormous amount of skimming or separation to take place; I believe the limit might be raised to 3·2, or 3·25, without causing any injustice to the vendors. Of course, in practice a limit of 3 per cent. becomes 2·6 per cent. or 2·7 per cent., since no discreet analyst will give a certificate on which proceedings could be taken, if the milk contains an amount of fat nearly approaching the limit of 3 per cent. The Sanitary Committees, who usually pass a resolution that proceedings shall be taken, on reviewing the analyst's certificate very properly are unwilling to take into court cases where the evidence would be liable to be disputed. If the limits were officially fixed at 3·2 per cent., or 3·3 per cent., it would give a working limit of 3 per cent., whereas at present it is in no case higher than 2·7 per cent., and only within the last few months could it be said to stand as high as that. In cases where I found an amount of fat between 2·7 per cent. and 3 per cent. I have been in the habit of certifying that the sample was of suspiciously poor quality, but not sufficiently bad to justify its positive condemnation. From 3 per cent. to 3·5 per cent. I usually certify a sample to be of a fair quality. I do not certify a milk to be genuine unless the results of its analysis have been such as to render it morally certain that no tampering, either by the removal of fat, or by the addition of water, has been practised. You see, if you fix a limit the analyst says to himself, first of all the determinations of fat may vary in other people's hands, at any rate as much as 0·1 per cent.; and then what are you to say? If you go into court, they say, "Look here, Mr. Allen, how is this? There is 0·2 per cent. of fat missing from this milk, and you bring this man into court." I reply, "No. I did not bring him into court. I only gave a certificate. He is brought into court because there is that deficiency of 0·2 per cent." "But I suppose chemical analysis is not an absolutely mathematical certainty?" "No, you have a certain possible error." "Here it turns out that for the sake of 1-15th of the proper amount of fat perhaps a man is hailed into court." That is the way it is looked at. It means in practice that sanitary authorities will not take into court anything over 2·6 per cent. If I were to certify that a sample of milk contained 2·8 per cent. of fat, they would say "Well, that is not a safe case for the court," and I say "Quite right"—it is not safe. Therefore we are not working at 3 per cent., and cannot as the limit stands at present work up truly to 3 per cent., and condemn everything that is under—2·9 per cent. or 2·95 per cent. We cannot do it. If the limit were raised a quarter per cent. then it would give a working limit of 3 per cent., and there would be no injustice. So that in fixing these limits we must always take into account that they can never be worked up to.

4510. With respect to your expression that you never certify a milk to be genuine, unless the results of its analysis have been such as to render it morally certain that no tampering, either by the removal of fat or by the addition of water, has been practised—what do you mean exactly by that?—I mean this; if I get a milk with 3·4 per cent. of fat, and normal non-fatty solids, I do not say that it is genuine for the simple reason that some milk would bear a lot of separated milk, and still the fat would not be brought below 3·4 per cent. If I were to certify it to be genuine I might find afterwards there had been private information given to the inspector to go round, and the man had said he had put separated milk in, or skimmed it, and they would find it not genuine. Therefore I object to have my signature at the bottom of the certificate, saying it is genuine, when it has been simply of a fair quality—when it is quite possible there may have been some cream removed by actual skimming of that portion of the milk, or there may have been the addition of separated milk. Therefore, unless it is something over 3·5 per cent. I do not say the milk is genuine. Of course those milks practically appear as genuine in the quarterly report; they are classed as genuine, or of good quality; but it is a serious matter to certify that it is genuine, unless you are quite sure.

4511. Do you think the provisions of the new Act call upon you to say it is genuine? I presume you are familiar with the provisions of the new Act?—I cannot say I am familiar with them; I have read the Act several times.

4512. Section 4 reads thus:—"The Board of Agriculture may, after such enquiry as they deem necessary, make regulations for determining what deficiency in any of the normal constituents of genuine milk. . . . . shall for the purposes of the Sale of Food and Drugs Acts raise a presumption, until the contrary is proved, that the milk. . . . . is not genuine." Does the existence of the section in those words, in your judgment, in any way modify the terms of your certificate?—No, they would not modify the terms. I have considered that section, which is familiar to me. I have not modified the terms of my certificates on that ground, nor do I quite see how it is open to do so. I should have to say—"from these results there is a presumption, unless it is proved to be otherwise, that the milk had a portion of the fat removed," and as soon as I used these words I know what the lawyers would say—the Town Clerks and the solicitors in the West Riding, and so on. They would say, "We are not going to take anything on presumption into court. That part of the Act is a dead letter"—they would say at once.

4513. Has that part of the Act actually been discussed by them?—It has been discussed by me with the Medical Officer of Health, but not actually before the lawyers. From our knowledge of the way in which the legal authorities take it I do not believe they would think of taking such a case into court, and I do not think the Health Committee of the City of Sheffield would think of taking any such proceedings on a mere presumption. Immediately I think there would be articles in the paper—here is this poor man, hailed into court on a mere presumption—he is called upon to go and prove his milk is genuine—and so on, and is put to a lot of inconvenience and expense, when there is no certainty at all about it, and the analyst himself could only say it is a question of suspicion. I am afraid that is the way they would look at it.

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4514. Do you mean to say therefore that from that point of view this section would be inoperative?—I think so.

4515. (*Chairman.*) It is an Act of Parliament?—Yes.

4516. The lawyers cannot go away from an Act of Parliament?—They will not take action; you can take a horse to the water, but you cannot make him drink, and they will not take such a case into court.

4517. They will not be obeying the terms of the Act?—You have got to read the Act with a good deal of water. It is a question with them whether it would not be a failure in court, and one failure means more than twenty successes. The authorities do not like to go into court and fail, nor does the analyst.

4518. (*Professor Thorpe.*) The Act says that the analyst shall have regard to such regulations in certifying the result of an analysis under these Acts?—Yes.

4519. He gives the results of his analysis?—Yes.

4520. We will say he puts down the amount of fat as 2·7 in this sample, the limit we will say, *ex hypothesi* fixed by the Board of Agriculture, is 3 per cent.; he draws attention to the circumstance that the limit fixed by the Board of Agriculture on which a presumption shall be raised is 3 per cent., and he finds on analysis that the fat contained is 2·7 per cent., which is equivalent to such and such abstraction of fat. He is not called upon to say anything more than that, is he?—He is not called upon to say any more, but when it goes before the magistrates I am inclined to think they would be very unwilling to convict on a mere presumption.

4521. Anyhow, it does not affect the analyst's position —I mean the subsequent responsibility is with somebody else?—It is somebody else's responsibility, but my feeling is that they would not take such a case into court.

4522. Of course they must take the responsibility of not doing that?—You have no means to make them. Unless you are going to examine their books and examine the analyst's books, and so on, you have no means of knowing what cases have been suppressed.

4523. When you make reports to the Local Government Board the nature of your reports could show these facts?—Yes. We could say a certain number of milks have had between 2·7 and 3 per cent. of fat.

4524. And it would be open to the Local Government Board, or the Board of Agriculture, to point out to the local authority that you reported such was the case, and that no action followed?—Yes, that would be possible. That might meet the difficulty.

4525. And the local authority would be called upon for an explanation?—I should imagine that they would.

4526. Are you aware of this clause: "If the Local Government Board, or Board of Agriculture, after communication with a local authority, are of opinion that the local authority have failed to execute or enforce any of the provisions of the Sale of Food and Drugs Acts in relation to any article of food, and that their failure affects the general interest of the consumer, or the general interests of agriculture, in the United Kingdom, as the case may be, the Board concerned may by order empower an officer of the Board to execute and enforce those provisions, or to procure the execution and enforcement thereof in relation to any article of food mentioned in the order." "The expenses incurred by the Board or their officer under any such order shall be treated as expenses incurred by the local authority in the execution of the said Acts, and shall be paid by the local authority to the Board on demand." Do you not think that is a sufficient safeguard against any breach of duty on the part of the local authority?—Yes, I think it is. I had read that section as applying to where they neglected to purchase samples. I had not read it in the sense you put it now, and I think that that would very likely meet the case.

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4528. So you think with that power, so to say, behind, the local authority might still be induced to take action upon such a disparity as you have drawn attention to?—If there be any large disparity. I think they are anxious to work the Act, and it would enable them to go into court and say, We have been told by the Local Government Board that we are wrong in not taking these cases, which would put the matter much more strongly. My two chief authorities, the West Riding Sanitary Committee and the Health Committee of the City of Sheffield, are very zealous and very willing to give the Act all the support in their power; but we meet with difficulties as soon as ever we get into court. It is there that the injury is caused to the enforcement of the Acts by cases being dismissed on the ground that they are too hard on the poor, unfortunate adulterator, who always has the sympathy of the public. The lower class public always lean to the side of the adulterator. When a man has a sample of milk taken, they will crowd round, and they will annoy the inspector as much as they dare. Instead of regarding him as a public official, one of their own servants, whom they ought to support, and who is acting in their interests, they regard him as an enemy. They are "agin the Government." I may add that public opinion is much stronger in the provinces than in London. An adulteration case in London gets a small paragraph in one of the Police Court reports; but if it is a serious case in the provinces it is apt to cause a couple of columns with large headings, and public attention is directed very much more thoroughly to it.

4529. Do you think that stirs up public feeling in favour of the adulterator?—I will not say that the newspaper reports do, because they very ably represent what has occurred; but I am quite certain that the inspector is not a popular man among the lower class of the population.

4530. Now, passing for the moment from whole milk, you are of opinion, I understand, that the onus should not lie on analysts of expressing an opinion whether in the case of skimmed milk it has been hand-skimmed or is the product of a mechanical separator?—Yes. It is possible by most excessive care to get hand-skimmed milk with very little fat, especially if you leave it long enough. I do not think it occurs in practice, but it will always be said, "Is it not possible to obtain it as low as that." "Yes." "But do you know that this was not so; what right have you got to say this was mechanically separated milk?" There is a High Court decision on the subject. One of the High Courts decided that the two things were distinct. It was decided on evidence in which there was no cross-examination. Since that High Court decision we analysts feel—I at any rate personally feel—that I am bound to try and make a distinction. Two or three years ago I held an opposite opinion, and thought they were only two different modifications of skimmed milk; but after that High Court decision I have got to draw in my horns, and hold a different view. I am bound to try and discriminate. Then when I try and discriminate I find there is no sharp line of distinction. It is always the analyst who gets blamed in these cases. "What business had the analyst to go and say it was mechanically-skimmed milk when the poor man comes into court, and he proves by himself and by his servants that he has not got a mechanical separator, and that it was done by hand? It is a disgraceful thing that the analyst should say such a thing." That is the position the unfortunate analyst is placed in.

4531. How is the matter at all raised?—As a matter of fact, this is new and has not been actually raised at present; but that is the general tone which is liable to be adopted.

4532. The matter comes into court, I presume, by the substitution of machine-skimmed milk for hand-skimmed milk, whereby the purchaser is supposed to be prejudiced?—Yes. I do not think the public realise that; but, taking it broadly, there is no doubt whatever that hand-skimmed milk contains over 1 per cent. of fat, and a reasonably well-made mechnically-skimmed milk does not contain more than 0·3.

4533. Looking at it from the point of view of the public analyst, the question arises when your inspector purchases a sample of skimmed milk, and he is served with separated milk?—Yes.

4534. He is thereby prejudiced by not getting the amount of fat which by use and wont he is entitled to expect?—Quite so, and which, until mechanical separators became common, he did get.

4535. Do you think, therefore, it would be necessary for this Committee to suggest regulations as to what amount of fat should constitute a proper amount for hand-skimmed milk?—Minimum amount? It would then be a presumption that it was mechanically-separated milk if it fell below that. There would come in presumption again.

4536. Are there many cases taken on this question?—At present I do not know. There have been none in my district taken; but I have given several certificates within the last few weeks where I have certified that it was mechanically-separated milk. I do not think they have gone into court yet; but since I have given those certificates in consultation with my brother analysts I find there was not so broad a line as was stated in evidence before this High Court decision which I relied upon, and therefore I feel that I may have transgressed unwittingly from believing too implicitly what was stated in evidence in that case.

4537. The object, of course, of skimming the milk is to take as much fat from it as you can?—Yes; the fat is more valuable than the skimmed milk.

4538. And as the matter now operates, the person who does the work of skimming carelessly is penalised?—Do you mean to say that he sells as skimmed milk a better article than he need?

4539. Unless he leaves a certain quantity of fat in he is apt to be penalised?—He will get in trouble under the Act, do you mean?

4540. Yes?—I do not understand you.

4541. If he does efficiently remove the fat by some method or other, he is apt to be penalised?—I cannot follow that.

4542. If he does not remove the fat efficiently?—Then it will pass muster as hand-skimmed milk.

4543. No; he is apt to be penalised?—I do not follow it yet.

4544. Of course, if he takes the greater portion of the cream off, although he may hand-skim it, he may be brought into court on the charge of using a mechanical separator?—Providing he overdoes it, yes.

4545. That is to say, if he does his work of skimming efficiently, therefore he is penalised?—I understand you now; that would be so. In practice I doubt very much whether it would come in, but I learn in conversation with my brother analysts that it is possible to perfect the process of skimming in the case of hand skimming further than I was aware of.

4546. Now what analytical factor or analytical criterion is it which gives the analyst the best evidence of the presence and of the amount of added water?—I am of opinion that the amount of non-fatty solids gives analysts the best general criterion of the presence and amount of added water in milk. I think the existing limit of 8·5 per cent. is fair to all parties; it is, of course, equivalent to a working limit of 8·2 per cent.

4547. What do you mean by that 8·2 per cent.?—I should not certify it to be watered if it is over 8·2 per cent., and no sanitary authority will think of prosecuting if it is over 8·2 per cent.; 8 per cent. only corresponds to 5 per cent. of water. If the analyst were to certify to 5 per cent. of water the authorities would say "We are not going to risk taking that into court"; my authorities would say so, and as a matter of fact, if I find anything over 8 per cent. I certify that the sample is of a very suspicious character, but not sufficiently bad to justify its condemnation. I will not take the responsibility of giving a certificate for 5 per cent. of water in milk, so that really the 8·5 standard disappears in practice.

4548. I may ask on general principles why do you give your certificates in that form when the decision does not ultimately rest with you as to whether action shall be taken?—Because I suffer, or have suffered, from zealous inspectors, who think if you certify to one per cent. or half a per cent. of adulteration, that is a case for court; they make a case of it. They are rather glad to make cases, and the analyst has to be a drag sometimes on zealous inspectors.

4549. I understand you to say that your analytical results are reviewed by a committee?—Yes, in some districts my analytical results are reviewed by a committee, but if I were to certify that a milk contained 4 per cent. of water, I think it would be a case where if there were a dispute very probably there would be no conviction.

4550. I thought you led us to believe that the revising authority was rather acting as a drag, and that they were not prone to take cases into court unless there was pretty strong presumption?—They are actually a drag distinctly in the question of fat; they would not take weak cases into court. But there are authorities and authorities, and I personally am not in the habit of certifying, or giving such a certificate as would be required in order that proceedings could be taken, if the solids not fat are over 8·2, or 8·1. It means, therefore, that the 8·5 limit in my hands comes down to 8·2 or 8·1.

4551. Surely if you act upon these low limits you must allow a very considerable proportion of the milk of Sheffield to pass without any action being taken?—Yes, of course, but not from my doing. The moderate amount of watering which can be practised, and which I do not see anything ever can prevent, costs a large city like that tens of thousands a year. The milk vendors know just what milk will just pass muster; they have got sympathetic magistrates—I do not say anything closer than that—certain sympathisers on the Bench; and I am afraid it would be worse than useless to attempt to draw the line very strictly.

4552. May I again point out to you that if you conform strictly to the implication of Section 4 you should merely certify that there was a departure from the limits, and leave the authority to do what it pleased with your certificate, and then you would be absolved?—In the future that would be so; I am afraid perhaps I did not realise that position; that has come with the new Act entirely, and it would be possible perhaps, in the future, to modify my certificate accordingly.

4553. Do you attach any importance to the determination of any other analytical factors in the milk than the non-solids and the fat?—Before any prosecution occurs on my certificates I have always determined the non-fatty solids twice, and the fat twice, and I have taken the ash once. In a case where any difficulty arises, or I want to convince myself, or I want—what shall I say—to have my opinion confirmed in some other way, I also ascertain the amount of nitrogen, which by calculation gives me the amount of proteid matters in the milk. I regard that as a valuable support. But again there is the natural variation. The nitrogen varies more in proportion to the average. There is a greater range of variation in the proteids than there is in the non-fatty solids, because where the proteids are high perhaps the sugar is low, so that I think it is more satisfactory to take the non-fatty solids than the nitrogen; but still the nitrogen is a valuable datum. I may point out that in the case of an altered milk, a modification of Kjeldahl's process, with a subsequent calculation of the proteids from the nitrogen found, gives the best possible indication of the original character of the milk. A milk may get altered; it may ferment, and go through the lactic, butyric, and other fermentations; and it may have undergone alcoholic fermentation in addition. That does not make the least difference to the nitrogen. All you have got to do is to put sulphuric acid to it, and boil it down and distil off the ammonia formed. Therefore if there were anything like a dictation of methods, I should like to dictate that Kjeldahl's process should be adopted in the analysis of altered milks.

4554. I gather then from what you tell the Committee that the most permanent constituent, or one of the most permanent constituents of the milk solids, is the proteid matter?—No, the nitrogen which originally existed in the proteid matter. It may decompose into ammonia or into amide bodies, I do not care which; it comes all out from the ammonia when treated with sulphuric acid. I believe that the amount of total nitrogen is not affected. If a person were to adulterate his milk with chloride of ammonium I must admit it would upset the deduction.

4555. Is there much ammonia in an altered milk?—I do not know; I have never determined it. I am pointing out that if the nitrogen of the proteids were converted into ammonia the fact would not affect the accuracy of the process.

4556. The point is, of course, respecting the permanency of the nitrogen?—If the milk goes acid of course the ammonia is fixed, and you do not lose it.

4557. Still it is potentially there?—It is potentially there; all the nitrogen is there.

4558. You do not know whether there is much potential ammonia?—I do not know whether there is much ammonia actually formed in the decomposition of milk; I have never ascertained.

4559. You are prepared to recommend I believe that there should be a standard below which a milk should be presumably defective?—There comes in the presumption—yes.

4560. Where would you fix that; what are the limits?—For non-fatty solids?

4561. Take both. In the first place may I ask you what is your opinion as to the form which these limits should take? Are you content to take the fat and the non-fatty solids, or would you take fat alone with the total solids, or would you take in addition the nitrogen?—I would take the fat, and the non-fatty solids. In the event of a milk which I believe exists—I do believe cases of that sort exist—with non-fatty solids sensibly below 8·5, I would let that through if it had a very high fat. I would go on the principle suggested by Mr. Estcourt of Manchester of giving good marks—certain good marks for every 0·1 per cent. of fat and certain good marks for every 0·1 per cent. of non-fatty solids, and those good marks together should come to 100.

4562. That would be met by defining a limit of total solids, would it not, because what you lost on the one hand you would gain on the other?—But then you see the one is much more valuable than the other. If you are short by 0·2 per cent. of non-fatty solids, you ought to have more than an increase of 0·2 per cent. on the fat to make it even, especially with such a low limit as 3; because it would mean this, that if you had a milk with 8 per cent. of non-fatty solids as long as it had 3·5 of fat you would call it right. I do not think that would be correct. You would have to go higher than that; it wants working out. I attempted to do it, and I did not succeed at the time, and I have not succeeded at present; but I think I could lay before you figures which would meet the case on the principle of the good marks. I do not think it is quite the same thing as saying "You must have at least so much total solids," because the fat is more valuable in that sense than the non-fatty solids.

4563. Then we gather that your recommendation is that the limit should be fixed with reference to the fat, and non-fatty solids?—Yes. I think the nitrogen a valuable criterion for the analyst, but that he should have to put it forward on the certificate would be a mistake, because we are bound to take a low limit for safety. Then supposing you take 0·5 per cent. (which I think would be right for nitrogen, but it is low), and then you are asked in the witness box "What did you find in that milk," and you say, "I found 0·51," you would be told, "Oh, then, it was over the limit," and immediately there would be a contention raised. It is quite difficult enough to meet these now. Magistrates and lawyers are beginning to understand the non-fatty solids, but I am afraid they would be puzzled still more if we had another datum. It is a thing for chemists, and a useful thing for chemists; but I object to that altogether; in fact I think it is a hardship that the analyst should be compelled as he is now by a High Court decision to state practically the non-fatty solids on his certificates. It is quite right that he should state the main grounds of his condemnation of the milk, but I should like to be allowed to say, if I chose to do so, "This milk contained only 0·4 per cent. of nitrogen; from that result, seeing that it ought to contain at least 0·5 per cent., I conclude there is 20 per cent. of water at least." I think that certificate would be just as good as one giving the non-fatty solids, and I do not see why the analyst of the future is to be tied to the non-fatty solids as being undoubtedly and for ever the best criterion.

4564. Of course, this is a legal question, and perhaps you may decline to answer it, but does not Section 4 rather alter your relation to that High Court decision?—I do not see how; I do not see what you are driving at.

4565. If these limits were fixed by prescription of the Board of Agriculture, and your certificate was simply couched in terms having reference to those limits, merely drawing attention to the departure from that, and the inference which might be based upon that, is that not sufficient in view of the decision of the High Court?—Then again it ties me down to a particular method of judging the milk when I might have devised a much better one—say the nitrogen or the albumin—for aught I know.

4566. It does not tie you down; it merely says you must have regard to those, but it does not say you must have solely regard to those?—It practically says the opinion must be based upon them.

4567. "An analyst shall have regard to such regulations in certifying the result of an analysis"?—Yes.

4568. It does not say "And shall have regard only to such regulations"?—I think it is a matter for the future. There is no doubt that at present the non-fatty solids is the best criterion. As a matter of principle I protest against being tied.

4569. We gather that your recommendation is that these regulations shall be based only upon the fat and the non-fatty solids?—If you understand that if you have a milk with a slight deficiency of non-fatty solids, it must have considerably more fat to pass muster, very well; but I object to your saying that that is the same thing as total solids, because I give a higher value to the fat.

4570. You say that in your opinion the vendor should be called upon to satisfy the court that the deficiency is in the terms of these regulations, is natural?—Yes.

4571. That surely is implied by the phrase that the presumption is raised until the contrary is proved?—Yes, I think the same idea is implied there, but then I would have a minimum limit below which no excuse as to the natural character of the milk should be permitted. Not everything is milk that comes from the cow.

4572. I am not aware that this Committee would have any power to suggest that there is some limit below which no excuse as to the natural character of the milk can be admitted; that is surely a matter for the Bench?—I imagine that this Committee in making its recommendations—assuming those were adopted by the Board of Agriculture—would be practically laying down a limit which would have all the force of law. I presume it would be promulgated by an Order in Council, or by a similar authority, and would have all the force of law. If it is put before the Bench that that is the official limit of the Board of Agriculture I feel certain that they would adopt it.

4573. There is nothing in the Act which makes any provision for an Order in Council?—No; I did not draw up the Act or pass it. If I had, it would have been there.

4574. We have got, of course, to take things as they are, that is the point?—Just so.

4575. Therefore, I am afraid that your first clause with the limit, below which no excuse as to the natural character of the milk should be permitted, is a pious opinion which we cannot act upon?—If there is no possibility of acting upon that I am very sorry for it, because we have got all the contention over again as to whether a man has a right to sell milk from diseased or from starved cows, and all sorts of things. They will come and say, "Please, sir, it came from the cow, and therefore I am not liable." That is exactly what we ought to exclude.

4576. You have some doubt I understand whether the same standard or limits should be adopted for all parts of the country, and all times of the year?—Yes; there is no doubt that milk does vary in certain parts of the country, and it varies according to the time of the year. What is the poor unfortunate analyst in Jersey to do with the present condition of affairs when all the cows give 6 per cent. of cream, and they can take away half the cream or fat without reducing it below the limit.

4577. Do you think it would be a practical measure to have a shifting standard?—No, I do not think it would. I think it would be quite impracticable. But still, there is the difficulty that we have got to let the whole limits down in order that the weaklings may get in.

4578. What has this suggestion that you have made as to the limit of fat and non-fatty solids, reference to—it has not a reference to an average condition of things?—No, clearly not.

4579. But to a practical condition of things would you say?—What recommendations are you suggesting? That there should be two limits.

4580. I understand you to say that you would waive your opinion as to the desirability of two limits on the ground of its impracticability?—No. I think it is quite practicable to have two limits, provided the Board of Agriculture exercise the necessary pressure to get a legal limit as an absolute minimum. What I said was that I was afraid it was impracticable to have different limits in different parts of the country, and at different times of the year.

4581. I understand you had given up the idea of a shifting limit?—I have given up the idea of a local limit so to speak.

4582. Or a seasonal limit?—Or a seasonal limit. I am afraid it is not practicable to take the worst cases; but I do contend that it is most desirable to have a limit below which no excuse should be allowed, because it simply means disease or such abnormality that the purchaser is not getting the article demanded.

4583. (*Dr. Voelcker.*) The limits fixed by the Society of Public Analysts have, in your experience, worked well, I believe?—I have used them.

4584. And from what you know of analysts throughout the country have you found that these limits have been generally adopted and have worked well?—Yes, I believe they are generally adopted and I believe they work well.

4585. Your general experience of your brother analysts and their work is that they are very careful before they run risks in connection with prosecutions?—Yes; and that is what really reduces the nominal limit to a practical limit of at least 0·3 lower.

4586. They do not like to be brought face to face with one another, and have conflicting results?—No, they do not.

4587. And there is also, more strongly perhaps in past times than now, a good deal of fear of having their results upset by the decisions of the Government Laboratory?—A very wholesome fear of it—a very real fear.

4588. So that really in many cases they have been induced to err on the side of leniency?—Yes.

4589. Do you consider that that has conduced to a material extent to the spread of adulteration?—There is no doubt of it. We are not able to take notice of the smaller cases. It has to be a very strong case first of all to pass the public analyst, then to pass the Sanitary Committee, and then to pass a magistrate who would like to dismiss every case, and who says, as he did in one instance say from the Bench that he "would do everything he could to thwart that most iniquitous Act."

4590. So that really the analyst has practically three tribunals to face?—Yes.

4592. Unless he is absolutely certain that he will be able to prove his case to all these three tribunals he will not bring it forward as one in which he would advise a prosecution?—No; quite so.

4593. And this he is bound to do for his own protection, is he not?—He is bound to do it in his own protection; the blame will always be attributed to him; he will have to bear the brunt of it.

4594. Of late there has got about an impression, rightly or wrongly, that the limits of the Government Laboratory have been raised?—I have heard so. I learned it quite accidentally. I saw it in a publication.

4595. Analysts have, one may say, taken rather more courage in consequence?—They will be able to work closer and with advantage to the public.

4596. And their so doing has not been because of any greater certainty as to the real quality of the milk which they have been examining, but on account of the greater certainty that they have that their results will be upheld?—That is so.

4597. Have you found in the cases that are brought into court any real difficulty arising now—I do not speak of past times—on account of the difference of methods?—No. I do not think I have ever had any of my milk certificates disputed by a public analyst. I have never had a public analyst come for the defence and say he had got a different result—yes, I remember there have been cases, but it is some years ago.

4598. I am speaking of recent times?—Recently it has not occurred.

4599. It is generally agreed that there are some methods, the Wanklyn method for instance, that were very good at one time, but are now practically given up?—That is so.

4600. Do you know any analyst of standing who would take a case into court or meet a brother analyst, and dispute a certificate on the strength of the Wanklyn method?—No; I should very much doubt whether there is anyone existing who would. I am not aware of it certainly.

4601. And there are other methods of which even the introducers would not maintain their accuracy in the light of what we now know?—No. We are all open to improvement—at least, I hope so.

4602. But there are a number of methods which are all very fairly accurate, which are adopted by analysts, and are recognised by one and another as giving practically equally good results?—Quite so. Take my own case. I was not a member of the Milk Committee of the

Society of Public Analysts when they made their experiments with a view of testing different methods of analysis, which eventuated in the adoption of Mr. Adams's paper-coil process for the determination of fat; but when that was published, I begged that it should not be adopted formally until other analysts like myself had had an opportunity of trying it. There was an adjournment for three or six months at my special request, and during that time I worked that method very carefully, and I convinced myself that it was the most accurate method we then had. Since that time the so-called Werner-Schmidt method was published, and with certain modifications which removed sources of error to which the original method is liable, I have most carefully and conclusively proved that it gives results strictly comparable, giving most close concordance with Mr. Adams's paper-coil process. It is a simpler method, and, therefore, since that time, when I was convinced it was equally accurate, I have adopted it, and I do not now use Adam's paper-coil process except in the way of a standard, in the same way as we have got a standard of length hidden away somewhere in the Houses of Parliament, but we do not use that for everyday purposes.

4603. At present you might say analysts of standing are agreed that there are certain methods which give perfectly reliable results?—Yes.

4604. They would not object to those being classed together in the way that Professor Thorpe has suggested?—No.

4605. Equally there are a certain number that might be put down as unreliable?—Yes, I think there are a certain number that might be put down as unreliable.

4606. Your objection is to having one stereotyped method?—Yes.

4607. Or to being tied down to use any particular method when you knew that another one would give equally good results?—Yes.

4608. You think that the fixing of one stereotyped method would prevent the improvement of methods in the future?—Yes. I very strongly hold that opinion.

4609. I take it that if you or anybody else were to find in the course of time a better method, one which you believed to be better, the ordinary way would be to introduce it to your brother analysts, or to the Society of Public Analysts, and to get others to try it?—Yes, that is the usual course.

4610. It is quite within the range of probability, indeed it is very probable that what would be a recognised method to-day might not be a recognised one to-morrow?—Or next month.

4611. If there were a stereotyped method of a Government Department it would take a considerable time before any alteration in that could be general, although analysts might be agreed as to another method being preferable to that stereotyped one?—I am afraid it would be a very considerable time.

4612. Has it not been the experience of analysts in the past that certain methods have been adopted by Government Departments, and that analysts have had to base their conclusions with reference to these?—Yes, it has been the case, not so much in respect to methods perhaps as to limits, and we have not been always able to learn what limits of impurity or purity were recognised at the Government Laboratory.

4613. There has been a considerable amount of uncertainty?—In answer to direct appeals I have been refused information.

4614. And analysts have not known by what limits their certificates would be judged?—No, we have not; we have not been able to learn.

4615. And that has induced them in the past to err on the side of leniency?—Yes. I am not speaking now of milk, but generally I am showing the difficulty of getting information.

4616. If the Board of Agriculture fixed a standard such as is proposed in the new Act would you, and do you think other analysts would, still have what you call a lower working limit?—Yes, we must have a working limit lower than the nominal one.

4617. Then that would not be acting in strict accordance with what is laid down?—I do not know whether it is in strict accordance or not; I am quite certain for my own part I should have to leave a margin.

4618. I understand you put it in this way—that whatever figures were fixed as the limits on the recommendation of this Committee analysts would still work according to a lower limit?—I should. I should not dare to certify to adulteration of a sample of milk containing for instance 8·3 per cent. of non-fatty solids.

4619. (*Chairman.*) I should be sorry to interrupt as a layman in the middle of this purely scientific enquiry, but I understand that under the Act, if the Board of Agriculture lays down any limits the analyst is relieved from any responsibility in that respect, and he simply gives his certificate that the milk he has examined falls below a particular standard?—Yes.

4620. Supposing the analyst discovers in the milk he is testing that the fat is 2·7, all he does is to record that fact?—The analyst might be safe in doing that, but if he were to record 8·3 of non-fatty solids the result would be that as soon as that went into court the defendant would immediately demand to have it sent to Somerset House. It is no longer in the discretion of the magistrates whether it is sent or not; and so it would be sent to the Government Laboratory when the milk was at any rate several weeks' old. Then the composition has to be reconstructed by the ingenious method which was devised some years ago, but which is not comparable with that for the new milk. I am quite prepared to find that there would be a difference in analysis amounting to a quarter per cent. between my analysis of new milk and the very best that could be done on reconstruction. Therefore I say it might quite possibly occur that the Government certificate would find 8·5, whereas I had found 8·3. The result would be that there would be a certificate sent down from the Government Laboratory, read in court, and the analyst would be said to be wrong, and therefore the analyst would take good care that no such case ever went into court.

4621. Supposing your analysis works out to 8·3, would you not give a certificate to that effect?—I would not.

4622. You would not?—No. I would not certify to adulteration. I should, of course, give the actual figure obtained, if required.

4623. May I ask why?—Because it would be liable to be sent to Somerset House.

4624. What would you say?—I should say it is of a fair quality.

4625. Would you not be asked to give actual results?—No, I am not asked to give them in a case of a sample which is not going into court. Where the article is alleged by me to be adulterated then I give figures; I do not give figures otherwise, and I should object to be called upon to do so.

4626. Surely under the Act you would have to do so?—I beg your pardon, the Act says nothing of the kind. It says the analyst shall certify whether it be genuine or if adulteration that it "contains the parts as under."

4627. Not in the section?—In the main Act—in the schedule prescribing the form of certificate.

4628. Is that not altered under this Act?—No.

4629. (*Professor Thorpe.*) Perhaps you could tell us exactly what is the manner in which you carry out analyses for your local authorities in the case of milk?—I ascertain very accurately the specific gravity of every milk brought to me, and by the Leffmann-Beam centrifugal process I ascertain the amount of fat. From these two data I am able to calculate the non-fatty solids. If those two determinations—the non-fatty solids and the fat—are satisfactory I do not proceed further, but certify the milk to be either "of fair quality" or "genuine," according to the figures obtained.

4630. And you very seldom give the absolute figures?—I do not give the absolute figures unless they fall below the limits, unless—I do not want to call it a preliminary examination, for it is more than that—unless this examination indicates a probability of adulteration.

4631. (*Dr. Voelcker.*) You give no figures when the sample is genuine?—I give no figures when the sample is genuine.

4632. (*Chairman.*) In cases where you doubt the genuineness of the milk do you give absolute figures?—Where the figures are such as to show the milk to be deficient and below the recognised limits it is analysed more thoroughly and accurately twice over by the methods I have already described, and then, if those further results justify it I give a certificate on which proceedings can be based.

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4633. But if the results of your analysis show that the milk comes very near what you call the recognised standards you do not certify that the milk is not genuine?—No, I do not. I certify that it is of a suspiciously poor quality, but not sufficiently bad to justify its condemnation as adulterated. I may say that there is one small appointment I have where they ask in such cases to have the figures, and they always have them. It is understood that they desire to do it; it is a fad they have got, and so I always give the figures.

4634. (*Dr. Voelcker.*) In the case of suspicious milk?—Yes; but in the case of genuine milk there has never been any desire or demand for them.

4635. (*Chairman.*) I understood from what you have already told us that if the full limit was fixed at 3 per cent. of fat and your analysis showed 2·6, you would not consider that that milk was not genuine?—To-day I should give a certificate on 2·6; if it had been last month I certainly should not. I have only quite recently been aware that the Government Laboratory are said to have raised their limit from 2·75 (which is close to 2·7) to 3. To-day I should certainly give a certificate on which proceedings could be taken on 2·6, but I do not think my authorities would be inclined to take such a case into court except on this new section; they have never done so in the past.

4636. (*Professor Thorpe.*) What induces the local authorities to take proceedings? Do you make them aware that the Government standard, as we may call it, has now been raised to 3?—I make them aware that we have had a great deal of trouble in the past with Somerset House, and that we have always got the danger of getting a certificate upset by a disagreement on the analysis; and, therefore, they say we have got Somerset House before our eyes, and we will not touch it.

4637. Again, may I point out that the condition of things is now altered?—I am very glad to hear it.

4638. I mean to say that the Act has altered it?—I have learnt through a publication with which you may be familiar, a publication called "Food and Sanitation," that the Government Laboratory now adopt a standard of 3 per cent. for fat. I never knew it before, the Government Laboratory never told me, the Board of Agriculture never told me, and the Local Government Board never told me.

4639. Have either of those authorities been in the habit of telling you of any standard, or any limit we may call it, being adopted?—Yes, in answer in court they have made known their limits, and that is where it occurred. I was not concerned in the case, but I believe I am right in saying that we only learnt from evidence given by one of the Government Laboratory officials in court that they had raised the standard of fat from 2·5 which we had for years and years up to 2·75—we only learnt it in court as the result of litigious proceedings.

4640. Of course, it is a dreadful infliction upon you I know to ask you to read Blue Books, but these facts have all been set out from time to time in Blue Books?—Unfortunately the English Government does not send us Blue Books—the American Government does. It is not my business to wade through every Blue Book produced, and I am perfectly unaware what is published, except, of course, the annual report of the chief chemist of the Government Laboratory which is presented to the Local Government Board. That does reach me a year and a-half after date, as a rule.

4641. May I point out to you that there has been no departure from a system which has been acted on for 25 years as regards the mode of communication with the general body of analysts?—I am afraid there has not; I wish they would communicate.

4642. There has been no obligation on the part of the Government Laboratory to communicate those standards?—Quite so; and no inclination apparently.

4643. When they are asked for?—I have asked for information at Somerset House and been flatly refused.

4644. Have you ever been flatly refused by me?—Yes.

4645. On what occasion?—I wanted to know what proportion of sand you allowed in pepper, and you said it depended on the circumstances of the case.

4646. That is perfectly true, and it is a proper answer to give?—I do not complain of your answer, but I have been refused information; and, therefore, it means this—seeing that I cannot learn except by having my certificate overruled I do not certify to the presence of sand in pepper however much I find.

4647. Take the question of milk, for we must confine ourselves to the thing we are talking about here, would you be refused any information as to what limits in the case of milk are adopted at Somerset House?—I cannot tell what I might be refused if I did ask. When I did ask for information I was refused.

4648. On the question of milk?—No, I made no communication on that. On the matter of milk I asked you for the detailed method which I learnt from proceedings in court was now adopted in Somerset House for examining altered milk, and that you kindly and courteously gave me for publication in my book. That I received from you. It was not a question of limits then, but you gave me the fullest information as to the method.

4649. Have you reason to anticipate from that action that I should have refused any further information that you would be good enough to ask me for?—No. It is only when we find in Court that a change has been made which we cannot be asking about every month or every year. It only came out in Court that you had changed your method or changed your limit; and that is the first intimation the analysts ever had of it.

4650. Are you aware that in many reported cases under the Food and Drugs Act the change in the standard of milk has been mentioned?—No, I am not aware of that.

4651. We cannot take any other means of publicity than the newspapers give us in a matter of that kind?—I do not know that we are referring to quite the same thing then. Are you speaking of a particular date when you speak of newspaper reports? I am not quite clear that we are understanding each other.

4652. Your organ, I believe, or certain organs which circulate among you, take note of the various prosecutions under the Food and Drugs Acts?—What are you referring to?

4653. I am referring to various organs; is it not the fact——?—You used the term "my organ" or "your organ."

4654. I mean the organs of the public analysts?—"The Analyst" reports appeal cases, but not ordinary prosecution cases.

4655. Would it not report such a significant action as any alteration in the standard of the milk?—I believe that is how I became aware of it, from probably a report in "The Analyst."

4656. Then it is rather the negligence of these gentlemen who direct "The Analyst" who have not kept their eyes open to what has been taking place for months past?—No, I think not. They reported that important case in which evidence was given by officials of Somerset House that they had raised their limit from 2·5 to 2·75 per cent., and it was only under those conditions that the public analysts became aware of it. The Editor or Sub-Editor of "The Analyst," I presume, saw that, and thought it was worthy of being recorded in "The Analyst," and, therefore, a report of that case was published.

4657. (*Dr. Voelcker.*) Previous to that was there any indication as to what the Government standard was?—None whatever, according to my recollection.

4658. (*Professor Thorpe.*) Except in the newspaper reports of cases?—No, I do not think it ever came out before.

4659. Pardon me?—Then we differ on a matter of fact—I was not aware of it.

4660. (*Dr. Voelcker.*) Previous to that nothing came out which analysts could have noticed?—That is so.

4661. (*Professor Thorpe.*) I must protest against that; over and over again it has been reported and the exact terms of the certificate have been given, in which it has been shown that 3 per cent. of fat was the limit by which the question of abstraction was judged?—Then it is a question of date; it was not so five years ago?

4662. No?—Then when, is the question? If we were in ignorance of it for five years it is a very serious matter. I would suggest that a circular might very easily keep analysts informed of any fresh departure on the part of chemists at the Government Laboratory, instead of their being left to find out by some cross-examination, which is not perhaps correctly reported in the newspapers, of a gentleman who appears from the Government Laboratory in a disputed case.

4663. (*Chairman.*) I think I was asking you whether your local authorities require you to give the absolute figures?—No, they do not in the case of genuine samples.

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4664. And you do not consider it incumbent on you to provide them with those figures?—No, I do not. I should very strongly protest against having to do so—for several reasons.

4665. Do you think that if any standard were laid down as suggested by the Board of Agriculture, in consequence of recommendations made by this Committee, you would still be excused from giving the absolute figures on which you report to them?—I think so in the case of genuine samples.

4666. But never in the case of any that you considered suspicious—then you would give the figures?—In any case which, on being further gone into and confirmed by more accurate methods, gave figures coming below whatever limits were fixed by the Board of Agriculture, as a loyal civil servant I should be quite prepared to give the figures.

4667. What would you do in a case where you found the total solids not fat were 8·3?—I should give the figure.

4668. And you would run the risk of Somerset House?—No, I would not run the risk; I would beg and pray of the authority not to take it into Court; I will give the figures I got quite frankly and honestly if I am compelled to do so, but, at the same time, we all know what has occurred in the past, and I would be very unwilling that that case should be taken into Court.

4669. You would give the figures if you were compelled to do so?—If it were held that I ought to do so, of course I would give the figures.

4670. In the case of any milk that you consider is not genuine you are compelled to give the figures, are you not?—No, I do not think I am; at any rate, it is not my practice to give the figures at present, unless I think it is a case strong enough for court. If it comes to 8·3 I say it is a very suspicious character, but I think the case is not strong enough to justify the condemnation of the milk as positively adulterated. I do that quite apart from any question of difference in analytical methods. I believe that you do meet with samples of milk, perfectly genuine samples, in which the non-fatty solids fall as low as 8·3, or possibly as low as 8·2 per cent., but in such samples I think the fat is always much higher. That is why I say you should take both into consideration, and if there is a considerable increase in the fat then you could afford to let them off a point or two on the non-fatty solids. I could not conscientiously say that in my opinion the milk was adulterated because the non-fatty solids were only 8·3 unless the fat were also low and the ash low. Therefore, it is one of those cases where there is a doubt which I consider it my duty to give the vendor the benefit of, and he gets that doubt several times over before he gets into court.

4671. And you would not on that add your opinion that there was any added water?—No.

4672. (*Dr. Voelcker.*) Do local authorities ever press you for the figures of genuine samples?—No, I have never been asked for the figures of genuine samples.

4673. Whatever limits were fixed you might still have a sample which would come up to those limits, and yet you might have a very good suspicion yourself that it was not genuine?—That is what I tell them. I have often said in my quarterly reports that there are various samples which I am morally certain have been moderately watered or moderately skimmed, but they are the cases where they are either at the limit or so near the limit that I have not felt justified in condemning them. I have also in my quarterly reports several times pointed out that we have to take into consideration what would happen if one of these samples were referred to Somerset House and were judged on the altered milk, which cannot possibly be relied on to give such reliable results as the fresh milk, although the method now employed is a vast improvement on what was formerly used.

4674. If in future it were purely the analyst's duty to give the figures and no judgment upon them, what would be the procedure with your local authorities; would they not come to you and ask you what the figures meant?—Yes, I should have to give an opinion as to what they meant in many instances certainly; but, of course, they are now getting used to this, and they would be able to read the Act, and if they had laid before them a regulation of the Board of Agriculture that all milk must contain 8·5, and it came to 8·3, they would say, "Very well, then; it is evidently technically low."

4675. If they were to go purely upon the figures, supposing certain figures to be laid down, they might on those figures take a case into court which you would not recommend action being taken upon?—Certainly, they would take it against my wish and desire. I think that is a danger quite apart from analytical differences. As I say again, a genuine milk can come down as low as 8·3 in non-fatty solids.

4676. Do you think the position of the analyst would be improved or otherwise by merely making him a returner of actual figures?—I think it is—I will not say degrading him—but it is reducing him to a machine, to an analyser; he is a mere handicraftsman if you are not going to ask his opinion based on his experience.

4677. Then you do not think public analysts as a body would be grateful for any ægis of this kind thrown over them, even if they could think that their responsibilities were to cease by their merely giving the figures?—No, they would get all the brunt of it and they would get all the blame.

4678. You might have a sample which was up to the limits and yet be sure that it was adulterated, because by determining other constituents in the milk, such as the nitrogen and the ash, you would find evidence that the milk was adulterated?—Yes, we can only take into court and take action on really bad cases, and there must necessarily be a possibility of skimming, or the admixture of separated milk, which is the same thing, and there must be moderate watering possible; I do not see how you can arrive at any other plan.

4679. At present you consider that the fat and the solids not fat are practically the only guide to go upon?—I think they are the data which should guide us at present.

4680. But at the same time you think that with a little more consideration of the points which have been raised analysts, by giving more attention to the matter, and in consultation with one another, might work out some plan which takes into consideration the amounts of nitrogen and ash as well?—Yes, nitrogen and ash as well—I will say both.

4681. If this could be done, it would be a valuable adjunct to the determination of doubtful cases and to the prevention of adulteration of an insidious kind which goes on?—I think that a careful analyst does use such confirmatory tests as those; he does not require to be compelled to do it, but does it as a matter of course. It is a very onerous position, and one which I feel very strongly, that the analyst's certificate is held evidence in his absence in a criminal prosecution, and that theoretically a man can be sent to prison on a certificate. I regard my responsibility very strongly. I do not believe anyone ever has been fined unfairly on a certificate of mine—and before he went to prison we know there would be a good deal more to say. But at the same time this most anomalous position is the consequence of the Sale of Food and Drugs Act allowing a certificate to be evidence in a criminal action.

4682. As against the addition of water the determination of the solids not fat is, in your opinion, the best safeguard?—Yes.

4683. Why do you prefer a statement of the solids not fat, say 8·5, to a statement of 11·5 or 12 per cent. of total solids?—You might have a milk with excessive fat in which the non-fatty solids came materially low. There has been known such a thing as adulteration by cream. I would rather take into consideration those non-fatty solids. The fat is the most variable constituent of the milk and the non-fatty solids the least variable; the best constant therefore. I think we should sacrifice a great deal if we only demanded total solids.

4684. You do not think that a requirement of total solids of which a certain amount must be fat should be adopted?—I should like to consider that; I have hardly thought that out.

4685. You are not prepared now to say whether you have a marked preference for a statement of fat and solids not fat to a statement of total solids of which not less than a certain percentage should be fat?—My preference at the moment is distinctly that which I have been used to—separating them; and if you ask me as to the other I should ask to think what to advise; I have not thought it out.

4686. I take it you cannot discriminate with certainty between the skimming of rich milk and the addition of separated milk?—I know no means of doing it.

4687. In your opinion the best safeguard for milk being of a good quality is to demand a high percentage

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of fat and a high percentage of total solids or solids not fat?—Yes, I think so.

4688. In your experience would 12 per cent. of total solids constitute an injustice—I do not say total solids alone; is 12 per cent. of total solids in your experience too high to demand?—I think that you might have milks that came from the cow not containing that amount. It is a perfectly proper thing to describe as a milk of fair quality, and I should not like to say that a milk might not be of perfectly proper origin coming solely from the cow and yet which did not rise to that.

4689. Is it too much, in your opinion, to ask that the public should be supplied with milk which gives 12 per cent. of total solids?—Not if there is that lower minimum beyond which nothing should be allowed; then I would not mind 12 per cent.

4690. If there was a lower minimum excluding milk below it?—If there was that lower limit beyond which they could not descend.

4691. Three per cent. of fat you look upon as an absolute minimum?—Yes, 3 per cent. of fat I should.

4692. If a milk had 12 per cent. or more of total solids ought there not to be 3·25 of fat if it be genuine; would a milk, for instance, giving 12 per cent. of total solids and 3 per cent. of fat, be a genuine one?—Yes, I think it would, except that it might have had some of the cream removed—I beg your pardon, I was thinking only of watering.

4693. If it gave over 12 per cent. of solids and only 3 per cent. of fat, it might be a rich milk to which separated milk had been added?—Yes, that is so.

4694. So that 12 per cent. would not be conclusive without a fat limit?—That is so.

4695. And a higher one than 3 per cent.?—Yes, if it had 12 per cent. of total solids I think it ought to have more than 3 of fat.

4696. If it had 12 per cent. of total solids it ought to have 3·25 of fat I may take it?—Yes, certainly 3·25.

4697. I may take it also that if the nitrogen in a milk differed materially from 0·5 per cent. and the ash from 0·7 per cent., you would be doubtful of its genuineness?—You say differed from. Do you mean fell below?

4698. If it differed materially?—If it fell below materially—not exceeded.

4699. I am going to put both cases to you?—Then I shall have to say yes and no.

4700. If it fell materially below 0·5 or 0·7 the presumption would be that it was watered?—I think if the nitrogen fell below 0·5 it is certainly watered; it is not a matter of presumption. I believe that is a very low limit for the nitrogen.

4701. If the nitrogen was below 0·5 the presumption would be that it was watered?—Yes, and a very strong presumption too.

4702. And with regard to the ash?—If the ash fell below 0·7 I should say nearly certainly watered. The ash is a constituent which analysts differ upon very much. Analysts who have analysed the same milk have given figures showing several points of difference from my own. That shows there are ways of determining the ash which are not strictly identical.

4703. I am just going to ask your possible assent to one or two propositions bearing on the last question. If milk fell below 3 per cent. of fat you would conclude it was adulterated—it would raise that presumption in your mind?—I object to the term adulterated, which does not apply to skimming, but it would have been debased.

4704. It is not natural?—It is not natural.

4705. If milk fell below 8·5 of solids not fat and the fat were below 3·25 would that raise a presumption in your mind?—Yes.

4706. If the total solids were 12 per cent. or above, and the fat was below 3·25, that would raise a presumption?—That there has been skimming?

4707. I put it generally that it would raise a presumption that it was not genuine?—Yes.

4708. If the solids not fat in a milk were 8·75 or above, with a nitrogen determination of 0·55 or above and an ash determination of 0·75 or above, it would raise in your mind a presumption that separated milk was added?—Yes.

4709. If you had a milk that gave below 8·5 of solids not fat with a nitrogen below 0·5 or an ash below 0·7 it would raise a presumption that that was not genuine?—Yes.

4710. If you agree, then, to these propositions, you would agree with me, I think, that it would be possible to work out limits introducing figures regarding the nitrogen and the ash which would be useful in checking forms of adulteration which undoubtedly go on?—I think it might be very useful to the analyst if carefully thought out; but I am afraid it would only lead to additional complexity when it got before the court if it were to appear on the face of the certificate. To the analyst it would be distinctly useful as enabling him to form a stronger opinion which, if he were ever cross-examined, he could explain. I think that is where its use would come in. It would mean a lot of work before you could attempt that; you would have to come back to the subject five years hence after having a special analytical committee appointed to look into it.

4711. You agree generally that if you fix limits of fat and solids not fat only, there will be scope for a lot of adulteration which might be checked; could further limits be introduced also?—Theoretically, certainly; practically, I am very much afraid they could not.

4712. At present you consider it ideal rather than practical?—Yes, I am afraid so.

4713. But you do not give up hope that something might be based on this?—No; on the contrary I should welcome any investigation of the sort conducted analytically.

4714. (*Mr. Cowan.*) I think you told us that you felt bound to take a low limit for safety in taking your tests?—Yes.

4715. Do you think that is the case with all public analysts?—Yes, I feel sure it is.

4716. Then, if that is so, what is the use of fixing a standard; would it not be necessary to fix a very high standard, so that you would be able to certify that it was a fair milk, if you would not act on the standard that may be fixed by the Board of Agriculture at all—if you go below it always?—As I have tried to explain, whatever standard is legally fixed—it should not be termed a standard, I prefer the term limit—whatever limit is legally fixed the working limit is sure to be below it.

4717. But public analysts, if they are thoroughly qualified men, should not fear adverse criticism in going before a Court?—Unfortunately, they will be held to have made a mistake, and that affects them prejudicially in relation to their authorities, and if they have private practice it is liable to affect them with respect to their private clients.

4718. I believe it is the case that public analysts have been found in mistake; is it not right that they should be brought before the public?—Yes, certainly. If a public analyst is found in mistake I certainly think he should be brought before the public. His position is so responsible that it ought to be known. My point is that, because the prosecution failed for some reason, the public analyst would be held to have made a mistake when he had not done so.

4719. It appears to me, from what you have said, that you would look at it altogether from a public analyst's point of view, but there are a great many other outside interests as well; there are the consumers, for instance; if you give an analysis of your milk and allow it to pass, that goes into the consumers' hands, and you are not doing justice to them, although you are doing justice to yourselves as analysts; you are too much afraid of your reputation?—I have to look at it from a public analyst's point of view. I do my best for the public, and I do my work as well as I know how.

4720. Would you not consider that your responsibility ceased when you absolutely put before your committees the analyses that you took of those milks that were brought before you?—No, I am afraid it would not cease; I am quite certain the consequences would remain.

4721. Does it not look as if there was a little lack of moral courage in the public analysts?—Yes, I think I am a moral coward.

4722. (*Dr. Voelcker.*) They are all as a body?—Of course.

4723. (*Mr. Cowan.*) You were speaking about separated milk; is there much of it sold in Sheffield?—Yes, it must be largely used, but I have no accurate knowledge of it. My work is inside. I do not go round sampling milk myself, and I do not know how much is used.

4724. You gave an indication, though, that there ought to be a standard for hand-skimmed milk?—That is to relieve the unfortunate analyst of his responsibility in deciding on the history of the article.

4725. What do you indicate that the standard should be?—I think if the fat were less than 1 per cent. the presumption ought to be that the milk was mechanically separated—at any rate if it were down to 0·8.

4726. But there are so many separators coming into use now; do you think it would be any use fixing a standard for hand-skimmed milk when you tell us that by hand-skimming the fat can be almost entirely taken out as it can by a separator?—I said that if you gave it time and took enormous trouble you could separate it very perfectly, and you would always be met with that excuse in Court. In practice I do not believe it falls below 1 per cent., whereas in the mechanically separated milk the fat is often down to 0·3—quite commonly.

4727. Have you any information to give us with respect to cream; have you taken any analyses of creams?—No, I know little about cream. As a matter of interest, if it has interest, in Sheffield the milk is delivered at nine or ten o'clock in the morning—I mean household milk—and is always left in a basin to throw cream up, and then when teatime comes it is skimmed off. In Sheffield people do not think of drinking, not at any rate with their tea, their skimmed milk; with Londoners we know it is generally all taken together.

4728. Can you give any information with respect to condensed milk?—Yes, there is no condensed milk on the market that is condensed more than three down to one—I should say three parts of milk to make one part of condensed milk. Very often a portion of the fat has been removed because it is easier to condense. I would incline to insist that where skimming is not indicated on the label the fat in the condensed milk should be not less than the amount of proteids as ascertained by any modification of Kjeldahl's test—in fact, the amount of proteids properly ascertained. That means this, that you have in the amount of proteids a measure of the concentration, and, without having to know what the original milk was, how far it has been concentrated. The proteids must increase as the water is evaporated off, and the fat will increase also; and, as there is normally at least as much fat as proteids in milk, the fat ought to be there afterwards. That should be the standard of fat in condensed milk; it should be not less than the proteids in the same milk—which relieves you of any calculation as to concentration, and of any trouble due to added sugar, and so on. I would say that the labels on condensed milk are most misleading. There is one of the best known condensed milks the makers of which say on the label that for the purpose of feeding children it should be diluted with from twelve to fourteen parts of water. Now, seeing that it never was concentrated more than three down to one—not twelve or fourteen down to one—it means that the children who are served with that milk diluted to that extent, in accordance with the directions of the manufacturers, are starved. They do not get all the fat; they only get a third of the important proteids of the milk—they only get a mere fraction of what they ought to get. It is necessary to dilute it to that extent, because it is mixed with a very large amount of cane sugar, and if only diluted again with water to the original measure it is as thick as treacle. If it is diluted to be used at the ordinary tea service with seven or eight parts of water then it is as thick as cream, although it has not got the fat of cream, and has only got about a third of the fat which exists in the original milk. I wish there was a means of preventing false labelling; it is doing much more harm than actual adulteration in many directions.

4729. (*Mr. Barham.*) What would you suggest should be the remedy for that?—That there should be a penalty for a wilfully false and misleading label or direction, which is really robbing the child of its natural sustenance. It is simply cruel to go and dilute a milk with 14 parts of water instead of with 2, which would be sufficient to bring it to its original concentration.

4730. But then you tell us that with the two it would be so thick that the child could not take it?—Then he should not be fed on it; it is unfit for children.

4731. I am not taking any exception to that?—There is an alternative—to use milk which has not had sugar added to it in its concentration. There are several brands of condensed milk in the market to which sugar has not been added, and those can be diluted to their original measure, and will then give a milk more or less palatable—not quite like the original, but as good as preserved milk can be, and which does not require to be so largely diluted.

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4732. Would you recommend this Committee in fixing a standard to fix a standard only for milk that has been condensed without sugar?—I do not quite know what standard you mean. I suggested that, in order to prevent either partially or wholly skimmed milk being used, that the fat should be required to be as high as the proteids. That applies to all kinds of condensed milk, and would be perfectly feasible. The other was a declamation against the practice of manufacturers telling you to over-dilute the milk, which they are bound to do, because their preparation is useless if diluted to a proper extent.

4733. Then it will get over the difficulty, from your point of view, if that tin of condensed milk was sold without a label and the buyer would use his judgment as to how he diluted it?—I am afraid that is worse; you are then relying on the ignorance of the people.

4734. I am thinking of the remedy?—I am afraid that remedy is worse than the disease almost. If you have got a label on, that label should indicate that the milk is condensed to one-third, say. I would like to make the manufacturer say, "I direct it to be diluted with fourteen parts of water, but it will make it worthless for the child." I cannot make him do that; but he ought to say how much it has been concentrated in the directions for dilution.

4735. You mean there might be instructions on each can showing the amount of dilution that the milk is capable of receiving, which would bring it down to the condition of ordinary genuine raw milk—I mean, having the same constituents?—That is the same thing as stating prominently on the label how much concentration has occurred; but, as a matter of fact, you understand that if you only dilute it to that extent it is unusable—it is as thick as treacle—it is a perfect syrup.

4736. There is no doubt it would be of great advantage, so far as children are concerned, that milk should not be condensed with sugar, and that anyone purchasing it should know readily, by looking at the label, the amount of water to be added to it to bring it down to the consistency of ordinary genuine milk?—Very well, and not only children, but other people, are not getting the nature, substance, and quality that they think they are getting when they get a milk put on the tea-table diluted to the extent necessary for the tea-table, and they get it with only 1 per cent. of fat in, and they use it instead of cream.

4737. Now, you say although at present the limit is 3 per cent., in no case do you advise a prosecution where the fat is 2·7?—That is as near as one would go now, but I think we might go to 2·8.

4738. I am speaking of only what is the practice now; 2·6, I think you said, and then you said something about Somerset House and so on, and then you got to 2·7?—I said 2·6; 2·7 I would go to now. There must be a margin for little differences.

4739. But then, if you have that margin that margin must vary, of course, with the ideas of respective analysts?—No, I do not think so.

4740. The margin that you would have you would not press on all your colleagues, and make that a hard-and-fast rule?—I would let them use their discretion; but if we fix the limit of fat in milk at 3·2 or 3·25, then the working limit would become 3, and we are all agreed, I think, that it ought to contain 3. When you talk to the dairy chemists they say it should contain 3, and they are not bound by the working limit; if they say it ought to contain 3 it means 3, but with us analysts it does not mean quite that—I mean to say there is no prosecution when it comes very close to the limit. I would like to see the legal limit made 3·25.

4740*. Then what you wish is that the legal limit should be 3·25, in order that you might be free to institute a prosecution or to recommend a prosecution when the fat was 3?—Yes.

4741. And therefore, as a matter of fact, if we recommended a hard-and-fast limit of 3 per cent. of butter-fat, that would meet your case?—If you recommend a hard-and-fast limit I know positively that that working limit will come in.

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4742. If there is an Act of Parliament, and upon that Act of Parliament the Board of Agriculture recommend or state a limit, surely that must be the limit, and you want nothing beyond that?—Then, supposing it is 2·9, and the case is taken into court, the magistrate will say, "Well, it is a very little difference; it may be that the analyst is wrong to that extent; I shall dismiss the case, with costs against the prosecution."

4743. Then, I suppose analysts are often wrong to that extent?—There is a limit of error which might come to 0·1 certainly between two analysts, and I have had cases myself of anasyles in my own laboratory where the fat might vary 0·1.

4744. Doing it on two different days, you might get a difference as much as that possibly?—It does occur. If I am cross-examined on a case like that, of 2·9, having gone into court, and I am asked, "Now, Mr. Allen, will you swear it was not 3?" I would say, "No, I cannot swear."

4745. Then, what you really want is for us to put, so to speak, a false limit on the milk in order that when you go to court you may say that 15 per cent. of the cream has been abstracted instead of saying 5 per cent. has been abstracted?—I do not like to put it in that way—"a false limit."

4746. No, perhaps not; but that is the object?—I would like to have a limit made, and I should say it would be perfectly fair to calculate from that limit as to how much fat has been removed, because it is a very low average now—a very low amount to be in milk—3·25.

4747. You think it is?—Yes, I believe the milks that pass through my hands which are really genuine go to 3·6 as a rule.

4748. Have you examined the milk from many companies yourself, or are you referring now to milk brought to you?—I am referring at the moment to milk brought to me under the Act, but there are other indications that it is frequently the case; 3·5 and 3·6 occur in the majority of cases where there is no good evidence of adulteration.

4749. You said a little while ago you know that your inspector was nearly as well known as the parish pump?—I said that the village inspectors of the Rural District Councils were.

4750. Do you not think in that case the seller would endeavour to give him as good a sample as possible?—I have no doubt he does.

4751. I think that is what you suggested?—I have no doubt he does, but still, those are only a small proportion of the whole. I think I gave the numbers. The large proportion are from the West Riding and from the City of Sheffield, where they take them with precautions. Sometimes a woman is employed to purchase in Sheffield; in the case of samples purchased by the West Riding County Council's inspectors, these inspectors and their assistants, having a long radius to work in, are not so well known as the local inspectors in those small districts I have referred to.

4752. You have not, as a matter of fact, had many samples direct from the cow or direct from the farm say?—Not of late years.

4753. Of your own knowledge you have not seen them milked and that sort of thing?—No.

4754. Therefore the reason for your stating that 3·6 would be a proper limit——?—Pardon me, I did not say a proper limit. I said that the milks which I regard as genuine which pass through my hands come up to 3·5, 3·6, and very often 4 per cent.

4755. But you have given it in evidence that unless the fat came to 3·6 you did not certify the milk as being genuine?—No, I prefer to say it is of a fair quality.

4756. That is to say, in your opinion genuine milk must contain or should contain 3·6 of butter-fat?—I say it is not certain that it is genuine if it is lower.

4757. That is where you draw the limit; you consider it is uncertain below 3·6 of butter-fat?—Yes; it may possibly have had some of the fat removed from it under 3·5, anyhow.

4758. Have you any experience of the difference between morning's and evening's milk?—Of course, I know of the difference that exists, but I do not discriminate between them; I have no means of doing so at all.

4759. What is the difference that exists?—Of course you get better milk in the one than in the other. I only know of what I have heard and read of others. I have never made a discrimination myself.

4760. So that you do not know really personally?—No, I have no direct knowledge.

4761. Would you be surprised to learn that it is as much as 1 per cent.?—Of fat?

4762. Yes?—I should be surprised to hear that as a rule, certainly, very much surprised; but, of course, we know that there is a difference.

4763. You would not have thought it was quite so much as that?—I should not.

4764. We have had it given in evidence before us that in some cases it is one per cent., and in some cases even more than that; in some cases a difference of as much as ·7 per cent. We had a gentleman here yesterday who said that?—·7 per cent. of the total.

4765. ·7 per cent. of the total of fat. What I want to point out is that if your minimum for genuine milk is 3·6 of fat, of course you must take in the morning's milk, and, therefore, the evening's must be 4·6?—Pardon me, I do not like that term, the "minimum for genuine milk." What I intended to explain was that I do not like to put my name at the bottom of a certificate saying a milk is genuine unless I am morally certain that there has been no fat removed.

4766. Yes, certainly?—That is not quite the same thing as a limit for genuine milk.

4767. Anyhow, it has not been your practice to give a certificate stating that milk is genuine unless it has contained 3·6 of butter-fat?—3·5.

4768. 3·6 you said a little while ago; however, I will take it at 3·5?—You see, it varies a little according to the non-fatty solids; you have got to take all the results into consideration.

4769. That is right; it is 3·5?—Yes.

4770. I will correct it down to that; that, of course, is morning's milk?—Well, it is milk——

4771. It must necessarily cover the morning's milk. Of course, you would not attempt as an analyst, I will not say to certify, but to pass the whole of the milk given by the cows in the morning as not genuine milk?—No. I have explained my position; I have no knowledge whether it is morning's or evening's milk, and, therefore, can make no difference on that ground.

4772. But if there is a difference of 1 per cent., it would mean that you would look for 3·6 of fat in the morning's milk and expect 4·6 in the afternoon's milk?—No, I am afraid I have never done so, because, first of all, it is news to me that there is as much difference as 1 per cent., and, therefore, I have not been able to take it into account in my practice.

4773. If we know that there is 1 per cent., what then?—Well, I shall have to consider how I am going to meet the case in future.

4774. What I want to point out is that 3·5 for morning's and 4·5 for evening's milk for the ordinary cow of the country—for the ordinary Shorthorn—is a very high standard indeed?—It would be, if taken.

4775. It would be so?—It would be, no doubt—4·5.

4776. You admit that?—Yes, I admit that.

4777. Then that, of course, would make the 3·5 a very high standard?—Pardon me; what I said was that 4·5 would be a very high figure for me to fix before I certified it was genuine; I do think it would be a very high figure.

4778. That is what I want, Mr. Allen, thank you. With regard to the 2·7 or 2·75 if you like, if that were raised to 3 per cent. and a hard-and-fixed limit made; supposing this Committee recommended that and the Board of Agriculture think proper to carry out that recommendation, that would then be an increase of 10 per cent.; do you think that on your present figures would do at all?—Yes, I think so as far as I can know the difference.

4779. That would be a fairly good increase to start with, do you not think so? I mean as compared with the present measure it would increase the present standard?—No.

4780. I will put it in this way: If we fix, or if we recommend, a 3 per cent. standard of butter-fat, it would increase your present limit by 10 per cent. about?—I cannot see it.

4781. If your present limit is 2·75 and we recommend

3, and you adhered to those figures, that is, if you paid attention to our recommendation, or to the Act of Parliament, it would be an increase of 10 per cent., would it not?—Theoretically it would; in practice you would not get any convictions.

4782. Then you think whatever standard this Committee might fix, the analysts would adopt a standard of their own?—No, it is not that; but, as I tried to explain before—supposing I find 2·7, and honestly report it so, and suuposing it to go into court, the magistrate would dismiss it, and I could not stand a cross-examination on it.

4783. Have you any foundation for making that statement?—Yes.

4784. There has been no case before the magistrates under this new Act at present?—I am speaking of the general practice of giving the defendant the benefit of the doubt, and then I say I could not stand cross-examination on it.

4785. This, you see, is a new Act altogether, and I do not think you can assume from the past what will be done in the future. Then I think you said with regard to the non-fatty solids that it had not been your practice in the past to certify milk as being adulterated which contained anything over 8 per cent. of non-fatty solids?—I said 8·2 and 8·3; and if the fat is high I should not certify if it was down as low as 8 per cent. If the fat is low, again that is a further confirmation. It depends also upon the ash and so forth—the secondary or subsidiary constituents of the milk.

4786. But you are recommending, as I understand, without regard to the ash or any secondary or other considerations, that the non-fatty solids be fixed at 8·50?—Yes.

4787. In the past you have passed a milk as genuine if it only contained anything over 8 per cent.?—No, pardon me, I have said in such cases——

4788. I mean you have not caused a prosecution or recommended a prosecution?—I have given a certificate in terms which would not allow of a prosecution, in the sense that I have certified that it was of a very suspicious character, but not sufficiently bad to justify its positive condemnation as adulterated.

4789. Then can you blame Somerset House if they have taken the same view in the past?—I do not blame them at all.

4790. I rather thought you did?—No, I do not blame them in any sense for taking the same view.

4791. You said if there was a difference of that percentage between the two results, you would not think of recommending a prosecution, because it might be thrown over by Somerset House?—Stop a bit; that is not quite the same thing. What I said was that there was a danger of Somerset House analysing a milk which was in an altered condition, and getting a variation from my result of 0·2 and very often 0·3. Therefore, if I had found 8·2 per cent. it might occur that they might find on that analysis 8·5, in which event the case would be dismissed, and the local analyst would suffer.

4792. Then if you gave a certificate at 8·5 on some occasions, and you passed milk with only 8 or 8·1 on other occasions, you could not blame Somerset House, supposing they made their limit 8·1, could you?—I do not know. The duty of Somerset House is to say whether the analysis is correct, and they give the figures of their analysis; and I say that they might find on such a milk, when analysing the altered sample, 8·5 when I had found 8·25; therefore they would say, very properly, there was no evidence of adulteration.

4793. I think the duty of the chemists at Somerset House hitherto has gone further than what you say. I think they not only have been expected to give figures, but I think they have also been expected to express an opinion with regard to those figures?—Quite so, but, on the other hand, if they found 8·5 they would have been justified in expressing the opinion that there was no evidence of adulteration, and it would be quite possible for a difference of a quarter per cent. to occur in the determination of the non-fatty solids in the case of altered milk.

4794. May I for a moment transplant you to Somerset House, and ask you to judge, as umpire, upon a sample of milk which contained 8·1 of non-fatty solids; would you boldly assert in that case that that milk had been adulterated?—I should report the amount, and express the opinion that it had been adulterated to the extent which 8·1 implied.

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4795. Why do you not do so in your capacity now?—Because Somerset House are in a different position from what I am.

4796. Then you suggest a standard lower—a second standard—below which no one should be permitted to prove that his milk was the genuine product of the cow; what figures would you suggest for that?—For the fat?

4797. For the fat and the non-fat; I take it those are the two things you are supposed to go for?—For fat I should suggest a higher limit of 3·25 and a lower limit of 2·75; for the other I would suggest 8 per cent. of non-fatty solids, below which I think he ought not to sell milk.

4798. (*Mr. Murphy.*) You are familiar with the words of section 4, I presume?—Yes, I have had them read to me.

4799. Have you considered the meaning of the words, "Or what addition of extraneous matter or proportion of water in any sample of milk, including condensed milk"; how would the intention of the section be met, so far as condensed milk is concerned?—I have considered those words, but I am not quite sure that I have considered them from that point of view. If you will kindly explain how you read them, I shall be pleased to answer you.

4800. You think the condensed milk can should show the proportions of water which have been evaporated to bring the milk down to a certain standard?—Yes.

4801. How would it be possible? Can you make any suggestion as to what regulation might be made for effecting that?—In the first place, it is not a deficiency in the condensed milk, but it is a false direction as to dilution. That is not covered by this section at all.

4802. That is what I thought. I was asking for information, and I was afraid that the power given under the Act would not help us very much?—Under the main Act there is a clause which has never been worked, at least I have never heard of any proceedings under it. In the main Act there is a clause saying a person who shall wilfully mislabel a thing shall be liable. I have never heard of any proceedings at all under that, and my authorities have never seen their way to take any such prosecution. If I may be allowed to digress a moment from the question of milk, I may say that there is a proprietary food sold under the name of somebody's Beef Peptonoids, which is on the label said to contain 80 per cent. of the nitrogenous constituents of beef, wheat, and milk. As a matter of fact, it contains 52 per cent. of milk sugar, and nitrogenous matter equal to only 20 per cent. of proteids instead of 80 per cent. My authorities do not see their way to proceed on it, because the retail vendor of the article is clearly an innocent party, and the proprietor, the manufacturer, lives in London, and we cannot initiate a prosecution in London. Here is this great scandal going on of a deliberate misrepresentation, saying that the stuff contains 80 per cent. of nutritive matter, when it contains only 20 per cent.; and this is only representative of a great many other instances of these special foods.

4803. Do you think there would be an advantage in prescribing a standard for condensed milks, such as could be prescribed, I take it, under this section?—The milk is right enough in its way; it is the false directions on the label that the Act does not meet.

4804. (*Professor Thorpe.*) May I point out, in respect to that, that of course fat may have been abstracted from it?—There you can lay down the conditions I have recommended, that the fat should in no case be less than the proteids. That would meet that case of using skimmed milk perfectly, but it does not meet the case of dilution. If they were compelled to put on the label the extent to which the milk had been concentrated—to say that this milk was derived from three gallons of milk by concentrating it to one gallon and adding sugar, that would show to any sensible person that he could not dilute it fourteen times to feed his children.

4805. (*Chairman.*) Is hand-skimmed milk, as you know it, a commercial commodity in Sheffield, as distinguished from separated milk?—Yes—I was going to say it must be, but I am afraid my logic is at fault perhaps. I often have milk containing more than 1 per cent. of fat, which evidently might have been skimmed, or might have been mixed with separated milk. My logic is faulty there. I think it is a declining industry; most people are getting separators now, but I believe hand-skimming still exists in the smaller farms.

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4806. Do you think it is not necessary for us to pay any attention to it, or to fix a limit for the hand-skimmed as distinct from the separated milk?—I think it would be desirable; if it does not exist it would do no harm, and if it does exist you would meet the case.

4807. Should we grade it—separated milk No. 1, hand-skimmed milk No. 2, whole milk No. 3?—Yes, I would suggest 1 per cent. of fat or lower—0·8 for hand-skimmed milk, and skimmed milk, if not expressly described as machine-skimmed milk, should be hand-skimmed.

4808. (*Dr. Voelcker.*) Do you mean to say that a man cannot hand-skim as perfectly as he likes?—I do not think it occurs in practice, but, of course, that is my weak point again—as I say, I object to the public analyst being called on to decide these things.

4809. (*Chairman.*) You are not quite sure whether some different standard or limit should be fixed at different times of the year; can you say if your experience in Sheffield shows you that milk varies there at different times of the year; have you a poorer quality of milk at one time of the year than at another?—I should not like to put it like that. I was mentioning that we had an excellent quality this last autumn, when the farmers were complaining that they could not get good milk. The milk then was giving 4 per cent., or a little under 4 per cent., of fat in every case. I have noticed in June—that is the only case I can remember—a fall in the quality of the milk, and I have drawn the reins less tight on those occasions.

4810. Do you find that that is pretty constant?—Yes, apparently just about June—of course it may be sometimes the 31st May—but just about that period of the year the milk does fall in quality.

4811. (*Mr. Barham.*) You speak of the farmers complaining through the last summer of the milk being poor, but, as a matter of fact, you found it rich?—It was in the autumn.

4812. During the heat of the year?—During September and October, I think.

4813. As a matter of fact, you found it rich?—Yes.

4814. You found a large percentage of butter fat in it?—Yes.

4815. I think you told us previously that that very often goes with a comparatively small percentage of non-fatty solids?—Yes.

4816. Then would not the farmers' complaint be with reference to the non-fatty solids?—No, those were such excellent milks—containing usually 13 per cent. of total solids.

4817. High in non-fatty solids as well as in fatty solids, then?—A full average of non-fatty solids, and very high in fat.

4818. (*Chairman.*) I suppose really the complaint of the farmers was that their cows were not giving as much as usual?—I have no doubt that that is really what was meant—they had not as much milk; but by the time it got into Court it was said the poor unfortunate farmer was being prosecuted unjustly for a deficient amount of fat.

Mr. G. D. Macdougald.

Mr. G. D. MACDOUGALD, called; and Examined.

4819. (*Professor Thorpe.*) You are a Fellow of the Institute of Chemistry, Analyst for County Perth, Fife, Forfar, and Kincardine?—Yes.

4820. You have analysed a large number of samples of milk?—Yes.

4821. You do this by a specially devised apparatus?—Yes.

4822. Would you kindly inform the Committee of your method of analysis?—It is set forth in an illustrated pamphlet which I sent to Mr. Rew. It is rather lengthy, and perhaps the best way is simply to refer to the pamphlet.

4823. In order that it should be down upon the notes perhaps you would kindly, as briefly as you can, indicate what are the principles of the method?—It is practically a modification of the Leffmann-Beam process, but in order that the analysis may be carried out very rapidly I have devised certain methods which do away with a great deal of the handling necessary. Notably I use air for the purpose of mixing the chemicals with the milk previous to reading off, and I use a projection lantern for the purpose of reading the fat. The object of the whole process is simply to make the analysis as rapid as possible.

4824. How many samples of milk is it possible for you to operate upon at one time?—Do you mean with one operation?

4825. Yes?—The little apparatus which I have I think does eight samples at a time; that is, each batch consists of eight.

4826. Does your method allow of the independent determination of the fat and the non-fatty solids in the milk?—It determines the fat directly, and the non-fatty solids is done by calculation from the gravity.

4827. What you do, therefore, is to determine the specific gravity of the milk, and directly determine the fat by a modification of the Leffmann-Beam apparatus?—Quite so.

4828. From whom do you get your samples of milk?—Mainly from large dairy concerns, and, of course, the usual samples from the police and sanitary authorities of the towns and counties for which I act as Public Analyst.

4829. The information which you are prepared to give to the Committee depends mainly upon your work for large dairy concerns, does it?—Mainly, but it includes samples from all sources—from private sources, from the police, and from sanitary authorities.

4830. Would you kindly explain to the Committee what are the results which you wish to bring before us based upon your examinations? In the first place, may I ask upon what length of time the results are based?—I have reported upon from July, 1897, until February, 1900, in all 12,069 samples.

4831. Would you please explain what the upshot of the whole examination is?—The gross average of the whole of these 12,000 samples is, fat 3·82 per cent., and non-fatty solids, 8·68 per cent. Then I took out the lowest single analysis in each batch of milks which came, and I have tabulated these, and the result is shown in the curves which occur upon these separate sheets.

4832. Perhaps it may be desirable in the first instance to analyse the curves which represent what we may call the normal supplies. Before, however, we do that, I should like to have some more information as to how these samples come to you; why do you get this great number of samples?—I have endeavoured, as far as possible, to develop this business of milk analysis, and I make the sending of samples as easy as possible by large dairy concerns, that is to say, I send out tubes properly labelled and sterilised; I keep these large dairy concerns that I deal with fully supplied with tubes, so that the labour of sending samples is reduced to a minimum. In that way I have developed this particular branch of analytical work.

4833. What is the object of the inquiry on the part of those who send to you?—As far as I can make out—and I believe it is perfectly correct—it is simply that the suppliers of these large dairy concerns are watched, that is to say, that the bad suppliers are cut off or warned.

4834. Do you get your samples from the farmer or from the large concerns who buy the farmers' produce?—From the large concerns who buy the produce.

4835. And they send these samples to you with a view to watching the character of their produce?—Quite so.

4836. Would you kindly analyse these curves therefore?—Really, the curves have only been in my hands within the last week, and I have not had time to analyse them myself. I made them up simply for this Inquiry, and it took me a very much longer time than I expected to actually get the curves down on paper, the number of samples was so large. In the non-fatty solids in September, 1898, you come very nearly down to 8·4 per cent. for the average for the month, which is pretty low.

4837. With reference to that, these supplies come to you mainly from Scotch houses, do they?—Not altogether. I have supplies from the North of England, from the Newcastle district, but mostly from south-west Scotland.

4838. Then, may we take it that this information has practically reference to Scotch cows?—To Scotch cows.

and a great many from the north of England from the Newcastle district.

4839. (*Mr. Barham.*) What does this red line mean in the curves on Sheet A?—That represents the mean; the black line represents the fluctuations.

4840. Are these black lines averages?—They are averages for the month.

4841. Averages for each month?—Yes.

4842. Not the highest and the lowest, but an average?—No, not the highest and the lowest, but an average for each month.

4843. (*Professor Thorpe.*) Perhaps you would kindly explain here to the Committee what exactly the curves indicate?—Taking the first Table on Sheet A—"Curves representing monthly average percentages of fat and non-fatty solids in 12,069 samples of milk"; from the dates mentioned the averages were taken for each month and spotted down on these Tables, so that each of these spots represents not the highest or lowest milk, but the average of this particular month.

4844. Pardon my interrupting you. Of course, the number of samples dealt with would be very variable throughout the successive months?—No, not very variable, because these dairy concerns—at least one or two of them—base their payments to their various suppliers upon the result of my analysis, and so they send very regularly a certain number per month; so that I do not think although there will be considerable variation that the variation will be very large.

4845. Of course, your 12,069 samples is the aggregate number?—That is the aggregate number.

4846. What is the exact monthly number dealt with, or, at least, approximately, the monthly number dealt with?—I could not exactly say just at the moment.

4847. Could you give us some idea of what ordinarily comes in a month?—It must be between 300 and 400 samples.

4848. Every month?—Yes, per month.

4849. Would you kindly proceed with your analysis of the curves?—The first Table represents the fat and the non-fatty solids in the gross number of samples. The fat reaches 4·23 and goes as low as 3·64; that is the variation in the fat.

4850. You had better indicate, if you kindly will, at what times of the year these maxima and minima are reached?—The maximum is evidently in September, 1897.

4851. And the maximum is over 4·2?—Quite so; and the minimum is 3·64 in April, 1899.

4852. And also in December, 1897?—Yes. There are two or three which come pretty close together—in December, 1897, in March, 1898, in April, 1899, and in August, 1899.

4853. And there is a further minimum very nearly in February, 1900?—Yes.

4854. Then these curves seem to show that the minimum amount of fats is obtained in December, in March, in April, in August, and in February?—Yes.

4855. Would the exact minima, or the exact positions of the minima, be at all affected by the character of the weather which obtained at those particular periods in those several years?—I have tried to ascertain if there was any correspondence between known curves which have been published by other observers and these, and I must say that there did not appear to be much agreement, but then you must remember that these curves are not known to be absolutely pure milk; they are simply as sent in by the various suppliers, that is to say, they are not curves of milks which have been known to be drawn from the cow.

4856. May we not take it that, on the whole, considering the large number of samples which are here dealt with, they are substantially the pure product of the cow?—I should think in the main that they would be the pure product of the cow.

4857. Otherwise the thing is of no relevance?—Yes, that is so.

4858. Then it seems from these curves to be shown that there is a minimum in the amount of fat in the spring, say, in March or April of each year, and a second minimum in the amount of fat towards the fall of the year, namely, in September, November, or December of the one year and the August of the next?—Yes, that is so.

4859. Now, dealing with the maxima, it seems that there is a maximum in the amount of fat in September, 1897, but there is a minimum in the amount of fat between August and September, 1899?—It is not a minimum, but it is much lower than it was in the year previous.

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4860. May I point out that there is an absolute minimum in August, 1899?—Yes, it is below the red line.

4861. What explanation have you to offer of that?—I have no explanation at all to offer of that.

4862. You have not compared the results with the character of the seasons of 1897 and 1899?—No, I have not had time to compare the character of the seasons with the curves.

4863. Are you able to tell the Committee, speaking generally, when there is likely to be a maximum or a minimum in the amount of fat present in the milk?—It is supposed, generally speaking, that during the winter months you have higher fat than during the spring and summer months.

4864. That is not altogether borne out by your curves?—It is not, but that is the general result of other observers.

4865. How do you account for the discrepancy between your results and those of other observers?—I cannot account for it. These are simply the results obtained, and very carefully obtained in my laboratory.

4866. Now, we will take the non-fatty solids. The non-fatty solids you told us are deduced from the knowledge of the specific gravity and from the knowledge of the amount of fat which the milk contains?—Yes, that is so.

4867. That is to say, they are calculated by a formula?—Yes, quite so.

4868. Possibly you use the slide rule?—Yes, I use the slide rule.

4869. Do you find any relation in your curves between the amount of non-fatty solids and fats?—When the fat is very high the non-fatty solids apparently are low. I think that comes out in Sheets B and C.

4870. Let us confine ourselves for the moment to Sheet A; is that exactly borne out by the indications of Sheet A? You see, you have a very large amount of fat in September, 1897—rather more than 4·2 per cent.?—Yes.

4871. But you have not a corresponding depression below the average in the same September?—No.

4872. If that influence were at work that you indicate, you at all events would suppose you would have a depression at least below the average?—It does not occur in 1897, but in 1898 there is apparently a pretty high fat—about October, November, and December, and in January, 1899, and a little earlier I must admit in the non-fatty solids you have a depression—that is, in August, September, October, and November.

4873. Might I again point out to you that in January, 1899, you have a relatively high fat—4·05?—Yes.

4874. And you also have a relatively high non-fatty solids—as high as 8·9?—Yes, if you pick out the month of January; but, generally speaking, the curves either approach or go from one another apparently; it does not follow quite accurately.

4875. It would have been convenient if you had introduced upon this diagram also the aggregate total solids, would it not, so that we could have seen how far the sinuosities of the aggregate total solids corresponded with the sinuosities of the two curves?—Yes, that might have been done had there been time; in fact, it has taken me three weeks to get out these curves with about six or seven people calculating, and there is a considerable amount of work in it.

4876. Take the other Table B, which you were about to refer to; what do you deduce from B?—I do not know that there is any special or outstanding feature in those curves; they simply give an idea of the percentage of fat in the various dairies represented by the various curves.

4877. Perhaps you would kindly point out to us precisely what the various lines mean. There is an unbroken black line, there is a dotted black line, there is a broken red line, and there is a whole red line?—Yes. In the letterpress at the beginning I mention that those curves in Sheets B and C represent the variations in the monthly average quality of 11,239 samples of milk from various sources examined from July, 1897, to the end of February, 1900. Each curve in B and C represents a different source of supply. That marked b, that is the plain black line, represents the quality of samples taken by police and sanitary authorities over a wide area in

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Scotland. The other curves represent milks sent for analysis by a few large dairy companies. So that with the exception of this continuous black line, a, c, d, and e represent dairy companies' supplies.

4878. I should like to get this clearly on the notes. The continuous black line represents samples which you have received in your capacity as a public analyst?—Yes, that is so.

4879. The whole red line represent what?—The whole red line represents, I may say, the supplies of a dairy company in the north of England.

4880. A particular dairy company?—Yes.

4881. The broken red line?—That represents the supply from a very large dairy concern in the south-west of Scotland.

4882. What does the dotted black line represent?—That represents a Glasgow dairy concern.

4883. Getting its milk from where?—Getting its milk from the surrounding country.

4884. Ayrshire and Stirlingshire?—Yes, all round Glasgow.

4885. Now, what do you infer from these curves?—They simply represent the percentage of fat from these various sources.

4886. I am afraid I cannot carry them quite in my mind. Just refer, for example, to April, 1898; in April, 1898, the particular dairy company represented by the unbroken red line had an average amount of fat of 4·47, or something like that?—Yes.

4887. The samples which are received at about the same occasion from the inspectors contain only 3·4 per cent. of fat?—Yes, slightly under 3·4 per cent.

4888. What do you infer from that—this is one of the minima which you received?—Yes. That is rather a peculiar point, that the one should be so low as compared with the other, but it simply shows that this particular dairy company were having good milk and the police at that particular time were being supplied with bad milk, or, rather, not bad milk, but lower quality milk.

4889. Those were taken from Dundee, I presume, or where?—From the Dundee district. Dundee is pretty well in the middle of my district. They would come from Perthshire, Fifeshire, Kincardine, and Forfarshire, and all the little towns, of course, that I act for as Public Analyst.

4890. Of course, a great number of these cases were obviously such as upon which no police proceedings would be taken?—That is so.

4891. Then are we to infer that the general character of the milk in your district around Dundee is below the average in April, whereas in other parts represented by the unbroken red line they had a maximum of fat in April?—Yes. The unbroken red line represents the north of England—the Newcastle district.

4892. Whereas, as I say, in your district where you operate as a Public Analyst they had a minimum amount of fat in April?—It so happens that in April, 1898, that is so; and the same thing apparently happens in 1899, where the English milk is above that supplied by the Scotch police.

4893. What explanation have you to offer of this in the case of April, 1898—confining our attention for the moment to that?—I do not know that there is any explanation; it is simply a fact that it is so.

4894. Are there any circumstances such as the period of lactation, the times of calving, or anything else, known to you, which would bring about a discrepancy like that?—There is not. Of course, if one had all the minutiæ and all the facts before them with reference to what actually caused this rise in that particular dairy, one would get an explanation; there must be some explanation, but I cannot particularise it.

4895. A very similar condition of things happens in October, 1899, where your public analyst's samples are at their minimum, and where the broken black line in October, 1899—referring to what particular dairy company?—The broken black line represents a Glasgow dairy.

4896. Their amount of fat is 4·25?—Yes.

4897. Those samples which have been brought to you in your capacity as public analyst for Dundee and the district show only an amount of fat of 3·25?—Yes.

4898. In fact, the lowest minimum that you have received in your capacity as public analyst?—Yes, that is so.

4899. Now, again, have you any explanation to offer of that discrepancy?—Since you have been pressing me to give explanations an idea occurs to me. I suppose when a dairy manager finds that his suppliers have not been giving milk which comes up to his idea of what milk ought to be, he may send round a circular to those who are sending the worst milks and say, "Now, if you send us milk like this we will have to delete your name from the list of suppliers," or something like that. Then, of course, that would be an explanation of why the milk goes up in quality.

4900. Yes, but I may point out to you that these are on an average of as many as 400 samples?—Yes.

4901. Surely if that consideration affected anything it would only affect a few individual cases?—It would affect all that dairy company's supply. Each of these lines represents a single dairy. You see the unbroken red line in December, 1897, and January, 1898, pretty low; in December, 1897, it is 3·5 per cent. of fat; in January it goes up a little; in February it also goes up a little. Now, suppose the manager has intimated to certain of his suppliers that this is not good enough, that may explain the rise in April.

4902. I wish to ask you a question on that point, confining ourselves, for the moment, to October, 1899; do you wish us to infer that this particular company with the broken black line supplies the districts which, in your capacity as public analyst, you receive samples from?—No; I do not act as public analyst so near Glasgow as that.

4903. Then how does that kind of consideration you have been speaking of affect the question? You led us to believe that because the amount was very low in October, 1897, a word might have been sent to a particular farmer to say, "We shall not have your milk any more unless you behave better"?—Quite so.

4904. How does that cause this immediately to jump up in October, 1899?—That has got nothing to do with the police samples; this is a private concern, and the manager of that concern may have caused this jump up at any particular time by simply sending round to those who are sending bad supplies.

4905. I beg your pardon; I thought you told us it was because the samples were so low in your district in October, 1899, that pressure was brought to bear upon the suppliers to send something better?—No, it must have been a misapprehension.

4906. There is no connection between those two?—There is no connection between the police and the actual dairy companies supplying. That is why I differentiated them and gave you separate curves, so that the actual qualities might be seen.

4907. Then you have not aided us in trying to get at some solution of these remarkable discrepancies?—I have not actually tried to show why this has happened and why that has happened, but I can see—now that my attention has been directed to it—that at least there are certain explanations possible.

4908. I take it that in the main—it is obvious they must be from the numbers given—the samples which have been received by you in your capacity as public analyst—that is to say, which have been taken by the local authority through their proper officer, and which are represented by the unbroken black line—have been genuine milk; you have included, no doubt, everything in them?—Yes.

4909. And it is obvious that they must be, inasmuch as they are considerably above 3·25 in fat; in fact, there is only one particular sample at that point?—Yes; in fact I may say I was rather surprised when these curves were made out to find that the police curve intermingled as it does, and had such a good quality. I should have expected the police curve would have been altogether below the qualities of these other milks; but evidently it is not.

4910. Therefore, again, it seems that in the main, even with the police curves, we are dealing with fairly good milk?—Yes.

4911. And, in the main, genuine milk?—Yes.

4912. Again, I cannot understand the remarkable discrepancies between the genuine milk received by a dairy company and the genuine milk collected by the police at the same period of the year?—I think that the explanation which I have given is a sufficient one; it would satisfy my mind, at any rate, without making actual enquiries of the managers of a concern. You can easily see how a manager can push up the quality of the milk if he cares.

4913. Have you anything further to tell us with respect to these curves. The curves on Sheet C show the percentages of non-fatty solids. One of the features is that the whole of the lines seem to keep very close together?—Yes, that is true.

4914. In June the curves appear to show that as regards the non-fatty solids the variations, no matter how you obtain the samples, are fairly regular throughout the three periods?—Yes, quite so. Of course, the interesting point is the totals. You will see that there is 3·82 per cent. of fat in the milks from all sources; that is the interesting figure.

4915. Just for a moment before we part from Sheet C, there is a very similar phenomenon to what we had previously observed that in September, 1899, where you have the maximum, or approximately the maximum value, amounting to 8·95, I think, of total solids?—Yes.

4916. Am I right in saying that this unbroken black line is the police curve?—Yes.

4917. And that the broken black curve represents the supply to a company?—Yes.

4918. You have there the minimum, namely, 8·32, or some such amount?—Yes, it is the minimum for a considerable period at any rate.

4919. Have you any explanation to offer to us on that?—No, I have really none, with the exception perhaps of the fact that in August, 1899, the police may have been more active than usual. In my districts they do not go very regularly; they take spurts, they waken up, and take a very large number of samples. The same explanation may be given that in August, 1899, the police may be very active. Then a month afterwards, when they take samples, the improvement is noticeable by the improvement in the quality. It is the same explanation as applies to the dairy companies—that where you have watching the quality goes up.

4920. Do you wish us to believe that when your inspectors are active there is an immediate improvement in the milk supply?—I think so, I think that that would be the effect of the inspectors being very active.

4921. You have given us the number of samples received in the aggregate per month; how many police samples among those would there be?—I would not like to say.

4922. Can you give us any idea?—I would not like just to say in the meantime, but it certainly is nothing like the number of samples that are received from the dairy companies; the police samples are very much fewer in number.

4923. Would there be a dozen a month?—Yes.

4924. Would there be 20 a month?—Yes, I should think so.

4925. Would there be 50 a month?—No, I do not think there would be 50 a month.

4926. Can you fix it any more nearly; you have given us the limits as between 20 and 50?—It is extremely difficult without access to my books.

4927. You could give us no impression of the order of the number—that is what I want to get at. I do not want to tie you down to a particular figure?—No. From one district alone I get 20 samples all at once from the police, so that that would spoil the average. In Perthshire they settle down on whiskeys sometimes, and sometimes on milks, and when they settle down on the milks I get 20 samples all at once. I think really I get more than 20 samples a month from the police.

4928. My object is mainly to get to know what is the value you attach to these particular lines?—I am very sorry that I really have not the data; in fact, if I had had more time I would have had a very much greater number of data. I can give you the value for one of these lines at any rate, if I cannot give it you for the others—that is for line a. The value is really very high; it amounts to more than half of all the rest of the curves.

4929. That is exactly the kind of information we want, because as the thing stands we are invited to practically assess these lines as of equal value?—They are not of equal value.

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4930. You give us no indication as to how we should differentiate them?—No.

4931. Will you kindly tell us then to which of the particular curves you attach most value as showing the variations to which natural milk is liable?—I attach the greatest value to the broken red line curve, that marked a, the minimum of which you have on the separate sheets I have sent in. The reason for giving you the other curves was simply that I might give all the information that I could give on the subject of milk. The value of that curve as regards numbers is 6,838 out of 12,069.

4932. These all being received from dairy companies?—Yes.

4933. The broken red line to which you attach most value represents what?—One large dairy company.

4934. And in the aggregate it represents 6,000 odd samples?—6,838 samples.

4935. Are these samples fairly uniform and distributed throughout the period?—Yes.

4936. They are analysed as regards fat, and on the next sheet as regards non-fat?—Yes. Also seeing that it was the curve that I attach the most value to I drew a set of minima in the large detached sheets.

4937. Now, if you please, we will confine our attention to those. I will not deal with the minima just at the moment, I will deal with the average results of the 6,838. We find that the 6,838 samples distributed fairly uniformly over from July, 1897, to the present time I may take it, or at all events to February, 1900, the minimum amount of fat in those samples is 3·58, or something like that, which occurs in July, 1899?—Yes.

4938. The maximum amount of fat was in September, 1897?—Yes.

4939. Where it was about 4·21 or 4·22?—Yes.

4940. There was a second maximum in January, 1899?—Yes.

4941. And a very similar amount in September and November, 1899?—Yes. You will notice, of course, that the oscillations of those curves are not quite so violent as some of the others—that is what you would expect.

4942. Still, there are certain oscillations about which I wish to ask you a question or two. In September, 1899, you have 4·1 per cent.; in October it suddenly jumps down to 3·6, and in the following month it jumps up again to 4·15?—Yes.

4943. Do you know of anything to account for that?—It may be due to a difference in the weather, a difference in feeding, or simply pure accidental causes.

4944. That is a very violent fluctuation?—Yes, from 3·6 to 4·1. It is not very great, of course, but still it is noticeable.

4945. Of course, had it been progressive it would look probably as if due to natural causes?—It may have been progressive. Do you not see I did not give it from week to week, I simply slumped all the months together—all the batches for each particular month. You see the lines jump from month to month.

4946. I am afraid these curves, valuable as they may be, have scarcely been sufficiently analysed by you to give us quite the information which possibly they contain?—That is so. They require a considerable amount of study—not only that, but you require to make a great amount of inquiry to actually find out what the reasons were for the oscillations in the curves.

4947. We may take it, however, as the result of your total inquiry on 12,069 samples that you find, taking them altogether, good, bad, and indifferent, the average amount of fat was 3·82 per cent.?—Yes.

4948. Of the non-fatty solids 8·68 per cent.?—Yes.

4949. And of the total solids 12·5 per cent.?—Yes.

4950. These amounts are rather higher than are usually found, are they not, as averages?—I do not know that they are.

4951. We have had a considerable number of analytical figures brought before this Committee, showing the results of the examination of large numbers of cows, but the average that you present is a little higher than what we have been accustomed to regard as the average composition of normal milk?—Then am I to understand that this is rather lower than the general averages?

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4952. No, I think your figures are a little higher?—Rather higher?

4953. At least that is the general impression I have; that is not your impression that they are somewhat higher than what you have hitherto seen?—I do not think so.

4954. Have you anything to tell us from your own knowledge as to the effect of feeding and breeding on the quality of milk?—No, not from my own knowledge. Of course, I believe most thoroughly that the quality of a milk especially is altogether a matter of feeding—when I say altogether, I mean within limits it is practically a matter of feeding.

4955. And not of breeding?—Breeding, too, of course—breeding and housing and all the things which go to favour high quality milk.

4956. To which do you attach most importance as the factors determining it?—It is very difficult to say. I should think that good housing and good feeding are the main factors.

4957. And not breeding?—Breeding, too, of course.

4958. Is it desirable or not that a standard or limit of quality should be fixed?—I think it is very highly desirable that a limit of quality should be fixed.

4959. What have you to say as to where the line should be drawn?—I think it is an extremely difficult question. It depends altogether upon whether this limit is intended to be sufficiently low to make it quite certain that anything lower will be adulterated, or whether the object in making the limit is to regulate the milk supply of the country and make it a fair and normal supply. If it is the latter, then I should think that a 3 per cent. for fat, or even as high as 3·25 per cent. of fat, would be easily maintained throughout the country.

4960. Would you desire that the limit should be fixed solely with reference to the fat?—No. I am speaking with reference to the most variable constituent, of course. I should think that a limit of 8·4 or 8·5 per cent. for non-fatty solids would be a fair and reasonable one.

4961. But if we are to take your results as representing the average condition of milk, namely, 3·82 per cent. of fat, then a limit so low as 3 would surely allow the addition of a considerable amount of separated milk without the fear of detection?—That is quite true, but it would allow less addition than the standard which we work on at present.

4962. What standard do you work on at present?—Up till recently for public cases 2·75 of fat and 8·5 non-fatty solids.

4963. Do you not think that the margin between the average condition of 3·82 and that which you suggest as 3 per cent. is not so wide as to allow a considerable addition of separated milk?—Undoubtedly.

4964. What leads you to select 3 per cent., therefore, as the minimum?—If it was left to myself, I should say 3·25. I mentioned 3·25 when you asked me to begin with what I thought with reference to a standard. I think 3·25 per cent. of fat would be easily maintained throughout the country.

4965. Would you be prepared to recommend that? That is what we want to get at?—No. I think I should recommend to begin with a 3 per cent. standard, until the country gets used to a milk of that quality.

4966. Would it not come to the same thing if due notice was given that the limit after a certain time would be 3·25?—It would; but the change, I think, would be rather violent; that is to say, the producers and sellers would require to feed better, and to see that the housing of their cows was better.

4967. Surely, it is a choice of evils; to ask the Board of Agriculture after a certain time to raise their standard might be open to objection. Would it not be better, on the whole, to give due notice that the standard would be so-and-so after a certain lapse of time?—That depends, of course, on how you look at the matter. I should think that perhaps a great deal would not be so bad——

4968. But we have heard so much to-day about the stereotyped methods of Government Departments, and the difficulty of getting them to move, so that surely it would be better to announce the standard you wish to have?—In that view, perhaps, the better plan would be to struggle for a higher standard.

4969. (*Mr. Barham.*) Have you put the contract form in that you have referred to in your proof?—I have put in one contract form.

4970. (*Professor Thorpe.*) Now, as regards the fat. On the whole, I infer you would be inclined to recommend as regards that a limit of 3·25?—Yes.

4971. As regards non-fats, what would you be prepared to suggest?—8·4 or 8·5. I am not quite clear on that point, either one or the other.

4972. Would you prefer a limit of non-fats and fats to a limit of aggregate solids, of which, say, so much should be fat? Which of the two would you prefer?—I am not quite clear upon that point. We have got so accustomed to talking about fat and non-fatty solids that I should for the moment prefer a limit of the one and a limit of the other.

4973. (*Dr. Voelcker.*) Is there much adulteration in the cases of the police samples that you have?—No, I cannot say that there is a very great deal of adulteration.

4974. Have many cases come into court?—Not many.

4975. You mentioned that dairies have analyses taken, in order that their supplies may be kept up to the mark. What standard do they have?—I think in the contract form I have put in it is 3·5 per cent. of fat and 12 per cent. of total solids. I am not quite sure, but you will see what it is in Clause 4 of that document.

4976. (*Professor Thorpe.*) Has that contract reference to any of these curves?—Yes.

4977. (*Dr. Voelcker.*) I see the contract says that the milk must contain not less than 12 per cent. of solids, of which not less than 3½ must be butter-fat?—Yes, that is so.

4978. Professor Thorpe has taken you so fully through your tables on the points which naturally suggested themselves that I need not take you through them again, except in regard to one point. You mentioned just now a suggestion that the sudden rise in the percentage of fat may have been in consequence of representations that the quality of the milk was going down and was too low?—Yes; that may be a cause of the sudden rise.

4979. Do you suggest that possibly such a thing happened in March, 1898?—Yes.

4980. According to sheet B, the fat then was 3·5?—Yes, 3·5 practically.

4981. The lowest point that the fat of that dairy reached was 3·24?—Yes.

4982. The consequence of that representation may have been that the fat jumped up next month (April, 1898) to 4·5?—Yes.

4983. Are we to gather that it ran down immediately the next month, because the next month we find it comes to 3·7 again?—Yes, and goes further down still in June, 1898.

4984. Would not one conclude that a stronger representation still would come?—You are getting into the summer months then, when the fat is supposed to naturally get low.

4985. I take your public analyst's samples for the same time, and they do not go low?—That is so.

4986. Nor do the other dairies?—That is so.

4987. It does not look very much as if that sudden rise in April, 1898, was the consequence of a representation of that kind?—I simply suggest that.

4988. The curve does not bear it out?—I simply suggest that; I do not know that the curve does not bear it out, because they may have made a special effort to send in good milk, and then fallen away again immediately.

4989. It was of a very ephemeral character, at all events?—Yes, ephemeral.

4990. And subsequent representations might very well have been made, but did not have any effect?—Well?

4991. It does not look as though they had?—I do not know. Here is another period, August, 1897, very low, and immediately it jumps up more than a half per cent. I do not know that there is really anything very strange or extraordinary about the oscillations of a half per cent. for the monthly averages, I think the extraordinary thing would be if the lines were much straighter than they are.

4992. To come to the point underlying this; are we to gather that when the milk gave after March, 1898, 3·6 per cent. of fat, you would not then tell your dairy

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company that it was of too low a quality?—I make no remarks of that kind, I let them judge for themselves.

4993. That is left entirely to them?—Yes; a dairy manager knows his business very well.

4994. Would you yourself consider 3·6 poor?—No, 3·6 is a very good milk, but from a dairy manager's point of view, if he can get half per cent. more, of course, he wants it.

4995. I think you allow generally that you have not had time to work out what is to be concluded from these tables; at present you do not see any clear correspondence between the changes taking place in different dairies?—There is no correspondence in the curves, at least I have not been able to trace much correspondence.

4996. You could not give us any information as regards the variation of the milk at different times of the year, judged from the experience that you have put together?—No, except that there is generally a lower fat in the summer months and higher non-fatty solids.

4997. You do not think that this may possibly be due to the method of analysis?—The method of analysis is absolutely the same from beginning to end. It is, of course, an arbitrary process, but, as I explained in that pamphlet, it is based immediately upon the Adams' and the Werner-Schmidt methods.

4998. Is it used by anyone but yourself?—No, I do not know that it is, because it is a very elaborate apparatus, and it requires a great deal of fitting up.

4999. But the advantage of it is that when once started you can do a large number of analyses?—A very large number of milks; and then there is no trouble; there are no scales upon the milk tubes. The correspondence with the Adams or the Werner Schmidt can be verified at any time.

5000. The adoption of this method has enabled you to give particular facilities to large dairy concerns?—Quite so.

5001. We have had it in evidence that you are in the habit of receiving large numbers of samples from different parts of the country, and not only from Scotland, but from the North of England?—Yes.

5002. And they are all done, I suppose, by that method?—They are all done by that method.

5003. You have mentioned that you send tubes and so forth to your clients?—Yes.

5004. And that these are sterilised; is there any particular object in that?—No special object except in the summer time. They are not only heated to sterilise, but there is a very tiny drop of formalin put into each tube simply for the purpose of enabling me to get the milks delivered in a fluid condition.

5004*. You give, I suppose, these particular facilities to the dairy companies, and also, I presume, the inducement of a lower fee, and so on?—That is so.

5005. But it is rather an expensive matter, is it not, to send these tubes about?—No. It only costs the postage and the cleaning—that is all.

5006. That forms, I suppose, a considerable inducement to the companies when they have these things ready at their hand?—I find it so. If the dairy manager has to clean bottles and get corks and labels and all that sort of thing, it is too much trouble.

5007. This, I suppose, you do in the ordinary course of your business?—Yes, I have developed that business.

5008. Trying to build up a milk analytical business, I suppose?—Quite so.

5009. When you have police cases, and have reason to report that a milk is not genuine, do you also use the same method?—That is an entirely different question altogether—no.

5010. Why not?—Not because I fear the results of those, but because I do not want to get into the witness box and have someone asking me by what process did you do this, and have to say by a process of my own. I should profer to say by some other person's process. That is exactly the reason.

5011. Then you do not base your figures on your method?—I was listening for a time here to Mr. Allen and I quite agree with every word that he has said, that we public analysts are so frightened, at least, I am so nervous about getting into what we call holes in Scotland, that any figure I put out on a police case I am very sure about.

5012. In other words, you are not so nervous about the samples from the dairy companies as you are about the samples from the police?—I admit I am not so nervous about dairy companies' samples as I am about police samples. I make perfectly sure that any figures I put out are not only done by the Werner Schmidt but by the Adams process, not only by myself, but by at least my head assistant.

5013. (*Professor Thorpe.*) How were the police analyses done?—All these police samples, at least those that I fear will become cases, are all done by the Adams method.

5014. (*Chairman.*) Are those on the chart done by the Adams process?—Not altogether; they are mixed up with the ordinary process.

5015. The ordinary process being your own?—I do exactly what Mr. Allen does, that is to say, when a batch, say, of 20 police samples come in, I immediately put them through this ordinary process as detailed in my pamphlet, entitled "Apparatus for Rapid Analyses of Milk," and I pick out those that are likely to make court cases, and these I direct my full attention to, repeating the analyses by the Werner Schmidt and Adams processes.

5016. (*Dr. Voelcker.*) Does the black unbroken line include the cases of adulteration?—It includes everything.

5017. Have you got the minima of these?—No, I have not.

5018. I want to know the point at which you have reported that a sample is adulterated?—2·75 and 8·5; I report on these standards.

5019. Then the inclusion of the adulterated samples may account for this police line being lower on the whole than the others?—I really cannot explain how these curves go up and down at all, but, of course, that will help to keep it down.

5020. So generally you do not rely upon your method in the case of police-court prosecutions?—No, not altogether—not when I am going into court.

5021. Has this method of analysis ever been disputed by your brother analysts or others?—I do not think there is any other one who has an installation of the same kind.

5022. Have you tested it against other methods adopted by your brother analysts?—I am continually testing these bulbs. If we break a bulb and make a new bulb it is quite as easy to test all the rest of the bulbs at the same time against a Werner Schmidt or against an Adams.

5023. I see in your pamphlet that you base the capacity of your bulbs and so forth upon actual determinations by some of the other methods?—Yes.

5024. But in the actual working do you ever—taking it over a series of analyses—see whether there are any differences between this process and other processes such as the Adams. I mean would the same results be given if the samples had all been analysed by some of the other methods?—I think so, otherwise the process is of no value at all; if it will not give fairly accurate results, then the process is of no value. It is practically a Leffmann Beam process with certain modifications to enable me to do away with the handling of the bulbs, the shaking of the bulbs.

5025. We have had complaints from those who have to rely upon the certificates of analysts that analysts do not always agree, and that if the same sample is sent to different analysts they get different results; have you ever been concerned with any of these cases?—Yes, unfortunately, I have been concerned with one or two.

5026. Do you think the strictures are warranted or not?—Not very long ago I was in a case where I beleive the other analyst made the analysis by the maceration process, the old stirring up process, you know.

5027. That is a very antiquated one, is it not?—Yes.

5028. You would not hold that that gave the same results as the more modern processes?—No.

5029. Would you put the differences down to difference of method or to individual differences or working among the analysts?—It is very hard to say; in this case there was a difference of a quarter per cent. That was the greatest difference that ever I have had occasion to notice between the analyses of any of the Scotch analysts.

5030. Are complaints general in Scotland in respect of the differences which analysts show?—No, I cannot say they are; they generally agree very closely.

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5031. You do not think there is any substantial ground for complaint on the part of milk dealers?—I do not think so.

5032. We have had it from milk dealers that they suffer very much from the variable results given by analysts, and that they do not know where they stand?—It is not my experience, because the modern processes are so well known, and if they are carried out with anything like faithfulness you ought to get very close results.

5033. Have you ever heard of test samples being submitted to different analysts in order to see whether their results agree?—Yes.

5034. Now, when you have had such a test sample sent you, you probably have only known of it afterwards?—Yes.

5035. Do you consider that altogether fair to analysts?—Yes, I think it is quite fair to the analyst. I have no objections to be tested in that way; in fact, I may tell you that I am continually by my own dairy companies tested in that way. They send certain samples from the same milk throughout a lot, perhaps 30 samples of milk, and then they send me afterwards the results.

5036. If you had a sample which you were told had gone to three or four other analysts, and which was a matter in dispute, would you actually rely upon your method, and give your results solely according to it?—Do you mean my volumetric method.

5037. Yes?—If I knew or suspected that a particular bottle was sent in by someone with the idea of testing it against another analyst, you may be perfectly certain that I should be very much more careful. Of course, all analysts know perfectly well that there are half a dozen loopholes whereby a mistake might creep in, and every analyst feels much more confident if he has another set of figures to corroborate the first set that he arrives at. I do not think there is any doubt about that.

5038. Would you pin your faith, in the case of a reference sample, on your volumetrical method?—Yes, within certain limits, that is to say I should not doubt it unless it was overthrown by another determination.

5039. (*Chairman.*) I understand Dr. Voelcker to mean, would you employ your own methods?—I would employ other methods as checking methods.

5040. (*Dr. Voelcker.*) Would you not come afterwards and say, "If I had known I was being tried against another analyst I would have done this by the Adams or the Werner Schmidt method as well"?—Yes, but I hope you will remember that all samples outside of those that I am doing in very large numbers—all samples that are particular samples, that is to say sanitary samples, where a man's credit is at stake—are always done by two or three methods.

5041. Is not your credit very much at stake if a dairy company sends samples from the same lot of milk to half-a-dozen different analysts in order to see whether their results are concordant?—Yes, that is quite true.

5042. Is not your professional reputation at stake then?—Yes.

5043. Has it never suffered by comparison with other people in that way?—I do not know that it has; I do not remember of any instance.

5044. You are not aware of any series of test samples having been sent in that way?—No, not further than what I have already mentioned, that my own dairy people are good enough to tell me when they send me a number of samples which are identical. Every now and again—every two or three months—they write me and say, "No. instance, No. 34, No. 60, and No. 78 are identical samples; please compare results."

5045. We have had it in evidence that retailers in Glasgow and elsewhere complain of the differences between analysts, and they also complain that the same sample sent to the same analyst does not always come out the same?—I have known of cases of that kind.

5046. So far as you know, you have not had experience of these cases?—Yes; as I say, I had one experience not very long ago.

5047. Has anyone complained to you that your results have not come out the same?—Where my result was a quarter of a per cent. higher in fat than the other analyst, when enquiry was made it appeared that the other analyst used the maceration process, and that explained the whole thing.

5048. That was explained so?—I think so.

5049. Have you ever had complaints that the same samples sent to you at two different times gave different results?—I am not aware of it.

5050. You analyse a number of samples which go to Glasgow, I believe?—Yes.

5051. According to your experience, 3·82 of fat is not at all too high a figure to fix?—That shows the average composition; I should not fix the limit of 3·82.

5052. I will put it in this way. You think 3·82 represents the average composition of the large number of milks that have come to you?—It certainly represents it, unless there has been an error made in the calculation, which I do not think; 3·82 represents the average of this large number of samples. But then these samples, it must be remembered, are from dairy companies that are really engaged in watching their supplies and endeavouring to get good milk.

5053. You know Mr. Stirling, of Glasgow, I expect?—I do not recollect.

5054. Do you know Mr. Kennedy?—At the present moment I cannot recollect the name; I may know Mr. Kennedy.

5055. Do you know Mr. Marshall, of Northumberland?—I really do not know Mr. Marshall, of Northumberland.

5056. He told us he had sent you samples?—Very likely; I get so many samples.

5057. We have had it from these people that they have submitted numerous samples to you, and, though you told us that the average composition of the whole series of over 12,000 milks is 3·82, it is rather remarkable that they one and all say that the standard of 2·75 is too high?—No, I do not know that it is very remarkable.

5058. There is a very wide margin between your 3·82 and their 2·75?—I do not know what is passing in their minds, but I should imagine they want to keep the standard as low as possible.

5059. You do not think it is because of any difficulty in producing that amount of fat?—I do not think so.

5060. (*Chairman.*) I think Mr. Stirling's contention was that no two analysts could agree; that there was so much liability to error among the different analysts that to make themselves safe 2·75 should be the standard adopted?—I understand.

5061. (*Dr. Voelcker.*) Do you agree that if such a low limit as 2·75 was fixed it would admit of a great deal of adulteration?—I am clearly of that opinion; I think 2·75 is too low.

5062. If you had a dairy company sending milk to you and asking your advice at what point they should draw attention to the lowness of the quality of it, what would you fix it at yourself?—That is purely a commercial question, you know, because it depends upon the price they pay. I think it is worth while working out commercially or finding commercially what actually is the percentage of fat and non-fatty solids which will pay best, because if you feed an animal very highly you may not be getting a higher return.

5063. You mentioned the influence of feeding; you said that fat was a mere question of feeding; I take it you have not really had experience of that yourself—you are only speaking from quite general knowledge?—I have never carried out experiments on feeding.

5064. You only give that as a matter of general belief?—Yes, general belief.

5065. (*Mr. Barham.*) You have had over 12,000 samples through your hands during the period covered by these Tables?—Yes.

5066. I suppose you look upon that as a very wide experience?—Fairly wide.

5067. And an experience excelled by very few in Scotland, at all events?—I think so. I think there is none in Scotland who has the experience of that number.

5068. Your opinion, based on that experience, is that you would recommend a 3 per cent. limit of fat and 8·4 of non-fat?—I think so.

5069. You recommend to this Committee that those are fair and safe figures for us to take?—Yes, I think so.

5070. Hitherto the standard that you have adopted, and that has been adopted for public purposes in Scotland, has been for fat 2·75?—2·75 for fat and 8·5 for solids not fat.

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5071. So that now what you are recommending is an increase of 10 per cent. on the previous standard?—Yes.

5072. (*Chairman.*) You have been analysing milk, I suppose, for a good many years?—Yes.

5073. How long have you been working at this particular process of your own?—I have been analysing milk in large quantities for the last ten or twelve years, but I have only given the results from the time that I began to use the process I detailed in my pamphlet. Previous to then I used other processes, all with the same object of doing milk analysis very rapidly.

5074. Do you find that the result of your new process gives you rather different results from what you were accustomed to look for from the old process?—No, because all the old processes were based upon the recognised methods, and this, in reality, is not a new process; it is simply an adaptation of an old process based upon the recognised standard processes as adopted by the Society of Public Analysts.

5075. Of course, I am only a layman, and I do not really understand the principles on which you work. The only thing I can see are the results, and I must say for myself that the results you present to us here show, as Professor Thorpe pointed out, a larger percentage of fats and solids not fat than has been laid before this Committee hitherto. I was wondering whether possibly your process had been more perfect than those that had been known in other times, and thus you manage to extract more fat?—I do not think that. The process is based upon the percentage of fat as extracted by the Adams method, and the tubes are standardised by that method, so that what you get by the Adams process you get by this process.

Mr. T. H. PEARCE, called; and Examined.

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5076. (*Chairman.*) You come from the Gloucestershire, Somerset, and Bristol Dairy Farmers' Society?—Yes.

5077. They have asked you to represent them here?—Yes.

5078. They have had a meeting on this particular subject?—Yes.

5079. Have they arrived at any conclusions?—They have passed a unanimous resolution in favour of raising the standard of milk to a minimum of 3 per cent. of fat.

5080. Anything further?—No, nothing more than that.

5081. 3 per cent of fat?—Yes.

5082. That was a unanimous resolution, was it?—Yes.

5083. At a large representative meeting of the farmers in Gloucestershire?—Yes.

5084. Themselves suppliers of milk?—We have a membership of eighty-five farmers, besides others—farmers supplying milk to Bristol.

5085. Can you say roughly what number of cows they would have?—What those eighty-five would represent?

5086. Yes?—On an average from thirty to forty each member.

5087. That is about 3,000 cows?—Yes.

5088. Do you yourself sell milk?—Yes.

5089. In what way do you sell your milk?—I have to guarantee it to 12 per cent. solids.

5090. Do you sell it to a factory?—No, I send it to one of the largest retailers in Bristol—a very old-standing firm. There is one other larger dairy firm, I think—that is the Gloucestershire and North Hants Dairy Company.

5091. You have to sell your milk, then, under a guarantee?—Yes.

5092. That your milk shall contain 12 per cent. of solids?—Yes.

5093. Of which not less than 3 per cent. shall be fat?—Yes.

5094. And you have no difficulty in meeting their demands?—No.

5095. Do you at any time of the year never find that you are short?—Very rarely. I have supplied the same customer for sixteen years. He analyses the milk himself. He has studied it for years past and learnt the art of analysing, and he analyses it practically nearly every week. I have a table of the analyses of my milk dating back to September 1st, 1896.

5096. Do you know whom he sends it to to be analysed?—He analyses it himself.

5097. He has got a little apparatus?—Yes.

5098. At all events, he uses what he considers the best means of arriving at an accurate result?—No doubt; he uses one of the most modern things, because he learnt it from one of the city analysts in Bristol. The total percentage, I should like to say, means that you average 12 per cent. on the day, but the morning's milk is not so rich as the afternoon's milk. At a quarter to five you start milking in the morning and in the afternoon at a quarter to one, so that there is not a regular interval. The difference chiefly is on the percentage of fat.

5099. What variations are to be discovered between your morning's and evening's milks?—1 per cent. in total solids, and that is nearly all in fat.

5100. There would be a variation, that is, of 1 per cent. in the fat between the morning and evening milks?—Yes.

5101. If your milk fell below the 3 per cent. that you guarantee in the morning, does your purchaser put it against the evening milk?—Yes.

5102. Can you tell us what your lowest percentage of fat has been in any one morning?—2·7 with total solids of 11·5.

5103. Does that often occur?—No, very rarely; that was on February 18th, 1896, and also on August 13th, 1897.

5104. Supposing that there were an official limit of 3 per cent, and the inspector happened to seize your milk on those particular mornings, you would be liable to be called upon for an explanation?—Probably I should be, unless the total solids were fixed at 11·5 and the fat at 2·7.

5105. Then you would not have got your 3 per cent.?—No, but you would have 11·5 per cent. of total solids.

5106. Of which 3 per cent. at least must be fat—is that not what it would be?—Yes.

5107. You would not be afraid of running the risk of a possible prosecution if the standard were fixed at 3 per cent.?—No, I think not.

5108. Speaking as a practical man yourself?—Probably that was some sudden difference in the atmosphere—a very cold time set in perhaps. No doubt that might have been the cause; it does affect the quality as well as the quantity—that has been my experience.

5109. You say that you know of separated milk being mixed with whole milk?—Yes.

5110. Because it could thereby pass your present low standard?—Yes.

5111. What is your present low standard in Gloucestershire?—I believe it is 10·5 of total solids.

5112. Do you think, as a practical man, you could be able to sell your milk according to its quality; could you grade it and get more for it if it contained more of the proper constituents of fat?—As a matter of fact, now I get a better price than a great many people in consequence of guaranteeing 12 per cent. of solids.

5113. That friend of yours, apparently, is not so fortunate as you?—No, he told me himself that he wanted to make more money of his milk, that his customer said he could not give it him, but he could separate one-third if he liked.

5114. And he proceeded to do that—he added a third of separated milk to his whole milk?—Yes.

5115. And then it went into the market?—It was good enough then to pass the standard.

5116. In fact, he was encouraged to do what some people would consider to be dishonest?—Yes.

5117. The raising of the standard, you say, would obviate that proceeding?—It would.

5118. (*Mr. Barham.*) Supposing that your milk is below the standard that you agreed to supply, in what way are you fined or punished?—We are not punished, but we have a notice sent saying that it must be altered; should it not be altered there is another notice sent, say-

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ing it must be done so within a certain time. I have never had any great difficulty whatever in doing so.

5119. There is no fine or any penalty of that kind?—No.

5120. They simply write to you and tell you it is not up to the standard, and then in the course of a few days or a week or so, they write you again?—That would be it.

5121. How often do you get a letter of that kind?—During the sixteen years I have been supplying him I do not think I have had more than about two.

5122. You are a wonderful man, then, certainly. You have discovered and ascertained of your own knowledge that there is a difference of 1 per cent. in the butter fat between the morning and evening milk?—Yes, nearly that—I have it here.

5123. Would you mind handing your tables to me?—Yes, with pleasure (*handing in same*).

5124. I see it runs from December 1st, 1896, up to the present time?—Yes. Those are all morning's analyses with the exception of where it is marked "afternoon."

5125. Apparently there is about one sample taken a week?—Yes.

5126. I see that your butter-fat produced under this special agreement, for which you get a special price over and above your neighbours, shows in the month of October 3·1, 3·0, 3·1, 2·9, 2·7, 3·0, 3·1, 3·0, 2·8, 2·7, 3·0, 2·9, and so on. So that you are nearly the whole of the time just on the border line?—Yes.

5127. And, in fact, if a hard-and-fast minimum of butter-fat were fixed at 3 per cent., you would be under a penalty on many occasions—you were 2·7, for instance, on the 18th February, 2·8 on the 30th August, 2·7 on 7th September, 2·8 on the 2nd July, and so on?—Yes; if you notice for the afternoon it is much more than made up; there is 4·7.

5128. Yes, that is quite true, but you know also, I have no doubt, that in Bristol you are not prosecuted on the averages of your morning and afternoon milks; the seller in Bristol would be prosecuted on any sample that he sold containing a less percentage than the standard?—Yes.

5129. So that you would be liable to be prosecuted on many occasions according to your own showing on these analyses; you know that, do you?—Yes.

5130. And in spite of that you come here and recommend us to fix a butter-fat standard of 3 per cent.?—I should much prefer it even if I had to go to a little extra expense in feeding to get that percentage, so as to stop the mixing that I know is going on at the present day.

5131. Now, with regard to this mixing, who is this friend that you speak of?—A farmer in Gloucestershire.

5132. What is his name?—He asked me not to mention his name.

5133. It is not fair to ask that?—He told me that in confidence; he said, "Don't mention my name."

5134. I do not wonder at his not wanting to have his name known; certainly if he does such a shabby action as this as to assist a dairyman in defrauding the public, which it appears to me to be. Do you think that your friend's milk naturally drawn from the cow would be of a higher quality than yours, or about the same, or what?—About the same, I should say; naturally it would be the evening's milk that he would separate, it going off the next morning.

5135. The morning's milk would be sent with the whole of his cream?—Yes.

5136. And with the evening milk, one-third of which would be separated?—Yes, so he would get out the richest part of the milk.

5137. What is the difference in price between his price and yours?—He did not tell me the price, but I should say about 2d. per gallon.

5138. Twopence per Imperial gallon?—Yes.

5139. The members of your association passed a unanimous resolution recommending 3 per cent. as a butter-fat standard?—Yes.

5140. Was anything said about non-fatty solids?—No.

5141. Is that the only resolution they have passed?—That was the only resolution they passed.

5142. (*Mr. Cowan.*) You sell your milk with a guarantee of 12 per cent. of total solids?—Yes.

5143. How much of that will be fat?—I do not think he mentions the quantity of fat in the guarantee that he wishes to get from you; 12 per cent. of total solids, he says.

5144. When you exceed that 12 per cent. or fall below it, does the price vary with you?—No, if it fell below it and I did not get it up again, he would give up the milk.

5145. What class of cows do you use in your district?—Shorthorns.

5146. Any Jerseys?—No.

5147. All Shorthorns?—Yes.

5148. Does the whole of the produce of your dairy go to him?—The whole of it.

5149. You neither make cheese nor butter?—That is so.

5150. When are your cows calving?—They are calving all the seasons of the year.

5151. Do you find that keep the quality pretty regular?—Yes.

5152. How do you milk your cows in your part of the country? I mean do you do it at regular intervals?—Not at regular intervals. If it were not at irregular intervals the analyses of my milk would come to over 3 per cent. of fat, but being milked at irregular intervals the morning's milk is nothing like so rich as the afternoon's milk.

5153. Have you found that in milking cows regularly there would be very little difference between the morning's and afternoon's milk?—If they were milked at regular intervals, with twelve hours between each milking, it would not vary much, if at all.

5154. Have you found feeding to have much effect on either the quantity of milk that you produce or the quality?—Yes.

5155. Considerable?—It makes a considerable difference in the quantity and the quality.

5156. Do you think breeding has an effect?—No. I rear most of my own stock. Of course, I find a heifer's milk a great deal richer than old cows' milk.

5157. You have a pure Shorthorn breed of cows in that case?—Not a pedigree stock. I always keep a good bull and rear my own stock.

5158. Are the farmers in your district in the habit of separating their milk with a separator?—No, not many of them—not the ones that sell the milk.

5159. You have given us one instance?—Yes, one instance.

5160. Do you not think it would be a bad affair for the country generally if the farmers began doing as that friend of yours has been doing?—Decidedly. It would make it bad for the farmers that produced a genuine article.

5161. Then there is not much separated milk disposed of in your part of the country for sale in the towns, is there?—A lot of the retailers keep separators.

5162. What becomes of the separated milk?—We have our suppositions on the matter.

5163. Does it go into the towns?—There is some retailed round the towns and some separated milk imported into the towns from a distance.

5164. At any rate, it is your opinion that there is no difficulty whatever in getting the standard up to 3 per cent. with a mixed herd of cows?—No, I think not.

5165. Do you go to 9 per cent. and 3 per cent., or do you hold just to the aggregate amount of solids up to 12?—I think perhaps I would say 11·50 is a minimum, seeing that in the case where I milk at irregular intervals I should be handicapped over those that milked at regular intervals.

5166. Would you expect that 11·5 to be composed of 8·5 of solids and 3·0 of fat?—Yes.

5167. Would that standard satisfy you and your district?—Yes, I think it would as a minimum.

5168. (*Dr. Voelcker.*) Are the analyses in the table you have handed in morning's milks only?—Yes, with the exception of where you see "afternoon" put against it.

5169. Mr. Barham has held before you the fear that must have been hanging before your eyes of prosecution on account of some of these cases where the fat fell below 3 per cent.; these samples were taken in periods ranging from September, 1896, to March, 1900, were they not?—Yes.

5170. I have taken the trouble to go over these figures, and I find that there are thirty-eight cases in which the

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fat determination was made ; there are four cases in which the fat came to 2·9, two only in which it came to 2·8, and two only in which it came to 2·7. You have told us that you milk at irregular intervals?—Yes.

5171. And that if you did not milk at such irregular intervals the quality of the morning's milk would more nearly approximate to that of the evening's milk?—That would be so.

5172. Would you have lived from September, 1896, up to the present time in very much terror of being prosecuted on these figures?—No, certainly not.

5173. If a standard were fixed higher than is at present in vogue, you indicate to us that you would have no difficulty in feeding up to it, or in so altering the times of your milking that you would easily reach the desired quality?—Yes.

5174. Do you take any steps yourself to see before the milk leaves your farm what the quality of it is, or do you rely entirely upon the results which come out afterwards?—I rely upon the results unless I should happen to get any intimation from my customer. In one case I had a complaint, and I had my suspicions of two cows that I was having milked at that time ; I tested their milk with a glass—only an ordinary glass that shows the percentage of cream. I found out that their milk was not showing what I considered the proper percentage of cream that there should be, and I took their milk out of the dairy, and the milk then supplied was all right. That was two cases that milked very heavy ; one was giving six gallons per day and the other five.

5175. The milk that is represented in these tables of yours is not likely to be any better than what comes from your farm, is it?—No. I should think where you have the lowest point there is about the time that I was speaking of when these cows were giving that low quality of milk.

5176. You recognise that by feeding or by suitably altering your arrangements you would have no difficulty in reaching a higher standard if one were fixed?—Decidedly I should not.

5177. Would it entail a dislocation of your business to make the hours of milking more nearly approximate to evenness of period than they do at present?—I am afraid the public at Bristol would object, because they want what is milked in the morning on their breakfast table the same morning that it is milked, and the afternoon's milk they want on their tea-table the same afternoon. There is a lot of trained milk that is imported into the city ; that is milked at regular intervals, and the evening's milk is delivered the next morning, and the morning's milk is delivered in the evening.

5178. Is the milk which the Bristol public purchase, as a matter of fact, imported milk only?—No. There is a lot retailed all of over-night's milk.

5179. And these two get mixed together, do they not?—No, mine is delivered warm to the customers.

5180. Yours is delivered straight to the customers?—Yes. It goes from my farm into my customer's premises—Mr. Case's—and is delivered out directly it goes in warm from the cow.

5181. Does the whole produce of your dairy go direct to the customers from Mr. Case without being mingled with other milk?—Yes.

5182. That you know as a fact?—Yes. I know it is put out of my churns direct into other churns and sent on the rounds.

5183. We have had it in evidence that round about Gloucester—I do not know whether it is the same at Bristol—there are a number of people who keep possibly only two cows, and perhaps do not feed them very well ; is that the case round Bristol?—No ; very rarely such a small supply would be sent in.

5184. There are not many of them?—I do not know anyone.

5185. Then in your district that is not a point that we have to consider very much?—No.

5186. Would you apply that to Gloucestershire generally, so far as you represent Gloucestershire?—The cows are kept in larger quantities than two.

5187. But you can quite imagine that if a man has only two cows, with one of them just after calving time, the milk delivered from that man's farm may be of rather a poor quality?—Yes.

5188. Do you think the public ought to be condemned to have milk of that low quality always?—I certainly think the public ought not to have the low quality of milk.

5189. You would agree that we ought not to have limits fixed on such a quality of milk as would admit of a great deal of admixture?—Yes.

5190. You consider that such admixture does go on, as a matter of fact?—Yes.

5191. (*Major Craigie.*) You speak of the feeling in Gloucestershire upon this subject. Have there been discussions other than those of your own society that have come to your knowledge in the neighbourhood of Gloucestershire or Somersetshire?—I do not know of any.

5192. At any rate not recently on this subject?—No.

5193. You have not heard any expression of feeling of alarm at the appointment of this Committee, or at the possibility of a standard being fixed by regulation?—No. The only one I have heard of was one that came from the North of England to our society against raising the standard. I forget now the name of that society in the North of England.

5194. But there has not been any suggestion from your own neighbourhood to that effect?—No.

5195. Is there any large sale of cream direct from your own neighbourhood or from the district you represent to Bristol or to other towns in the county—I mean cream as apart from milk?—No, not immediately around Bristol.

5196. Is there in any other parts of the district with which you are familiar?—There is cream brought into Bristol from large factories. I know my customer, Mr. Case, gets a lot of cream from other factories.

5197. Has your society considered at all the question of the sale of cream or the possibility of a standard for cream?—No.

5198. That has not come before you?—No ; practically it does not interest the farmers.

5199. There is not a cream trade amongst you?—No, not amongst the farmers.

5200. Speaking of your own herd and the figures that you have laid before us, what is the breed of your cows?—Shorthorns.

5201. Are they all Shorthorns?—Yes.

5202. They are not Jerseys?—No.

5203. Can you say that many of your neighbours are producing a milk of a somewhat similar standard to yours—is that your impression that there is a good deal of it produced?—All the farmers that send milk to this one dairy have to produce their milk to that percentage of solids—12 per cent.

5204. In the same manner as you yourself?—It is 12 per cent. of total solids, and none of them have any difficulty in doing so.

5205. With reference to the question that you have just replied to about the times of milking, is it a fact that in the Western Counties you have had great difficulty in getting labour to milk in sufficient time in the morning?—I have not had any difficulty so far myself, but I am afraid I must come in now that men have been called out with the Army, and that we shall find a great difficulty.

5206. The milking is all done by men, is it not?—I have one woman that milks—the cowman's wife ; but it is very rarely that you find women in our part of the country willing to go out to milk.

5207. We may take it, as representing your society, that the general feeling is in favour of having some standard?—Yes.

5208. You are not content to be left with no standard?—Decidedly.

5209. And that that standard should be what you have told us, 3 per cent. of fat?—Yes.

5210. (*Professor Thorpe.*) Does the recommendation also extend to 12 per cent. of total solids?—No. There was no mention of total solids by the society.

5211. We have gathered from you that there is no practical difficulty in a number of farmers conforming to a demand of 12 per cent. of total solids?—That is so.

5212. Without taking any very extraordinary or special precautions as to the nature of their beasts?—They are all practically the same breed of cattle in our neighbourhood.

5213. They have not to go out of the way—they have

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not to weed out any considerable quantity of beasts, or add any very rich milkers, such as Jerseys, or anything of that kind to make up?—No.

5214. (*Mr. Barham.*) You have been asked with regard to the 12 per cent. of total solids, and you have given an answer that there is no difficulty about it; but you mean that there would be no difficulty in making an average of total solids?—For the day?

5215. You do not qualify it with that?—I think I said so just now.

5216. Previously you did, but in answer to Professor Thorpe you said you would not like a standard fixed at 12 per cent. for either meal?—I think I said 11·5 just now.

5217. You did; that is quite right. This friend of yours that skims one-third of his milk, is he a member of your association?—No, he is not at the present time. I might say that this man has given up milk selling now. It was done while he was in the trade.

5218. He did not find it pay, then?—I suppose he did not—even with separating one-third.

5219. Dishonesty very seldom does, I think?—He has turned his hand to something else.

5220. I see there were 120 samples examined, and of these thirty-eight had the amount of fat determined; in the determinations of the fat four were 2·9, two were 2·8, and two were 2·7?—Yes.

5221. Then 20 per cent. of those of which the fat had been determined were below 3 per cent., the butter fat standard that you now recommend., and 10 per cent. of them were as much as 0·2 and 0·3 below that?—Yes.

5222. (*Professor Thorpe.*) Of the total number of milks examined, 122, eight only were found to have their fat below 3 per cent.?—Yes.

5223. Why were the fats determined in some cases and not in others?—I should say because the total solids were not so high as he thought they ought to be.

5224. That led to a determination of the fat?—That led him to analyse for the fats.

5225. (*Mr. Barham.*) Will you hand those totals in?—I should be pleased to leave those tables with you.

5226. Just another point; you milk at very unequal periods?—Yes.

5227. Would you prefer if it were a matter of choice left entirely to yourself to have more equal periods?—Decidedly.

5228. But you milk at those unequal periods because your customers want warm milk in Bristol, and your particular customer gives you more money for it than if you sent out one milk under the other, and if you sent what is called railway milk?—Yes.

5229. And you get probably a penny or twopence a gallon more for warm milk than you would for cold milk?—Yes.

5230. Therefore it would be a very serious thing if you were compelled, so to speak, to milk at more regular intervals?—I should gain more milk, but I should not be able to make such a high price.

5231. I mean your profit is greater under your present arrangement than it is likely to be under an arrangement for milking at more equal intervals?—Decidedly it is.

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5232. (*Chairman.*) I believe you represent the Evercreech and Mid Somerset Agricultural Society?—Yes.

5233. Did that society have a meeting to consider this question?—It did.

5234. What conclusions did they arrive at; did they pass a resolution?—Yes; they thought 2·75 of butter-fat would be quite as high as our neighbourhood could produce it.

5235. And of solids not fat?—They never mentioned anything about the other solids at all.*

5236. They simply said in their opinion 2·75 was the standard which should be fixed for the percentage of fat?—Yes.

5237. Could you give certain reasons of your own why you come to that conclusion?—Yes, I can give certain reasons.

5238. Will you lay before the Committee what your reasons are?—In the first place it makes a difference whether you have your cows in all the year round. If they are calving all the year round of course you have a more uniform percentage of fat in your milk. I myself make cheese from the 1st of May till October, so therefore I bring in the greater part of my herd somewhere about February and March—not February, say March, April, and the beginning of May. Therefore, if I sell my milk in May I shall have a job even to get my milk up to 2·75, I believe; in fact, I have tried it, and I know I should have. You would have a much more uniform quality of milk when you sell milk the whole of the year, because you have your cows coming in all the year round. Another thing that affects milk a lot is a very wet May. When the grass is saturated with water you find then the milk very poor indeed; in fact, the milk is always poorer in May. In cheese-making we can make 25 per cent. more cheese in the month of September than we can in the month of May; it is about a quarter better in September than it is in May. So in fixing a standard which is to be, we will say, a fixed standard, it would be a job for some to get up to 2·75 in May, I believe; in fact, I have a case here where a gentleman thought he had three extraordinary cows last June, and he had them tested; one of them is 2·8, one 2·3, and the other 3·6, in June.

5239. Who made these analyses?—It is George Jackson—and big butter manufacturers they are. It is his manager at Evercreech. The Maypole Dairy Company it is called now. He is doing it all the while for the company I think. It is done by the Gerber test. In an abnormally dry season, of course, I could bring before you where my brother-in-law was summoned at the Marylebone Police-court. He lives at Bushey, in Hertfordshire. He was summoned for having sent milk to London adulterated with 6 to 7 per cent. of water, as analysed by Professor Stokes. The defendant swore it was pure milk as milked from the cow. He had witnesses who also saw the cows milked, and sent samples to Mr. Lloyd, who returned a certificate of 9 per cent. of added water. Then Mr. Lloyd came to the farm and saw the cows milked; he certified 8 per cent. of added water, but corroborated the defendant's statement that it was a pure milk from the cow. Mr. Plowden dismissed the case, saying the defendant was not liable for the composition of the milk, but only for any water which might have been added to it. In an abnormally wet time you get a lot of water in your milk. Last August I had a friend who milked twenty cows. I do not believe in the cream test myself, but his would not go up any higher than 7 in the cream test, and he was feeding with cake. I have been taught that 7 in the cream test would in the Babcock or Gerber test be about 1·75—I do not know whether that is right. In sending milk away, or in taking samples, the samples ought to be taken at the departure platform. There is so much robbery going on all the while—not when it arrives here. Then I think you would get a truer statement of the fact. It is stolen all along the line; in fact, I have cases; and not only stolen, but if you look at it in a sanitary point of view they always try to hide their theft by filling it up with water, and you do not know what that water is composed of or where it comes from or anything of the sort—which is important, looking at it from a sanitary point of view.

5240. Do you find that that is a hardship amongst the farmers in your district?—We do. Even myself, I had a young fellow taking milk to the station—my night's milk. Of course, the cream naturally rises on the top, and it was very thick. I suppose it was put in overnight in the churn possibly. I send my milk to a man who makes cheese and sends away accommodation milk. This fellow was known to take a round of bread with him every morning. The man I sell my milk to sent back to us that my night's milk was so very poor, and he found bread in it. I followed that boy up, and he took all the cream off the churns and ate it, and gave it to schoolboys and so on. That is how we get served.

5241 Why did you not seal your cans?—It is all very well to seal the cans. This very man that I sell my milk to had a can from Scotland something like a beer-barrel with a gutta-percha rim round it, and he could turn it upside down and nothing would run out; but, still, by the time you send it to London twice it gets so bulged that you could not do it then. Even if you sealed your

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* The witness subsequently wrote: "Although at the meeting to which I referred the question of 'solids not fat' was not discussed, the Society had previously, for their own purposes, considered the point, and came to the conclusion that between 8·50 and 9 per cent. of solids not fat was fair standard.

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churns with the cover on they can pour the milk out and they can pour water in—even if your churns were sealed. The other day I had a friend of mine sending milk to Southampton, and he had great complaints that this milk was short measure, so he thought he would go down by the train. He got out at the different stations by the way, I believe he got out at Eastleigh, and there he saw one or two porters going with cans. When he went in, of course he was a bit too sharp; there were three or four covers off, and they had their cans, so they dropped the cans and let them go down into the milk. He had the milk poured out, and found the cans in the bottom of the milk. That is the game that is being played.

5242. That churn was not sealed?—No, that churn was not sealed. There is a means of sealing the churns; I believe I have got a little seal here (*producing same*).

5243. We have had it in evidence that several farmers find they can seal their churns, and then they are all right?—This one you have to pinch together afterwards, but it would not hinder anybody from pouring the milk out into a vessel and covering up that theft by adding water to it.

5244. Then it is not a good seal?—That is a little simple thing, and my man that I send milk to said he had 5,000 sent to him.

5245. Do you say that the railways object to the cans being locked?—I have heard so, but I do not think they do. I suppose they do, too. I do not see why it could not be done in this way. Ten pounds would be within a fraction the weight of a gallon of milk, and if the cans were in some way stamped by the Board of Agriculture and the milk was sent out by weight, I think it would be much fairer all round. That is my impression. Then the cans could be sealed.

5246. What cheese do you produce in your district?—Cheddar.

5247. When do you have your cows calving down?—I do not have them calving all the season—all the year round. I get them coming in March and April, and the heifers in the beginning of May. We are at some distance from London and there is not a lot of milk selling done until just in the winter months; and if we sold anything towards spring our standard begins to be much lower. Of course, the longer the period of lactation, the longer the cow has been in milk, the better the milk. Another thing I did the other day. I had a cow, and I milked half a pint myself of the first milking out of the four teats, then I milked half a pint of the very last strippings. The one was 1·1 per cent. and the other was 11·0 per cent. That shows how a bad milker, a lazy fellow, will reduce the standard of your butter-fat, and how there may be nearly a sixth of that cow's butter-fat gone. I was a judge two years ago, or three, I forget which, at the Bath and West of England. There I had a young fellow leaving in four cows four pounds four ounces, and he was considered to be a good milker sent out for the contest.

5248. If an inspector happens to get hold of that milk where the strippings have been left in, do you not think it is right the farmer should suffer?—I do not think it is right the farmer should suffer.

5249. He should be called to account for sending such stuff into the market?—It is like this; when a milker leaves this milk in a cow it is so small a quantity that although I would consider myself a pretty good judge of milk left, and, if it was left in one quarter I could discern it, yet if there was a little left in all the quarters I could not discern it.

5250. Do you think it is right that the public should get that bad milk?—What are you to do? You have such a difficulty to get milkers and you cannot go and draw after them; you cannot do it all yourself. We are simply in the hands of this class of people.

5251. If you had fixed such a standard as to admit of your sending out milk without the strippings, sent in it, surely that standard would lead to a great deal of fraud, would it not? We cannot fix a standard so as to catch this particular milk, could we?—It may be an uncommon case; we do not have this done by everybody.

5252. We have not to deal with the exceptions?—That is an accident I suppose. I do not think the thing is done regularly; it would be a bad job if it was. In taking samples of milk to be analysed under the Food and Drugs Act, here is one thing I should like to mention. Supposing a man sends three churns or five churns, or two churns to a London platform, wherever it is sent I think that that milk ought to be mixed together, and all the churns put into one thing, and well mixed before a sample is taken. I send away once a day. I put my evening's milk in a vat or tub, and supposing I took a bowl next morning and dipped one bowlful off, not skimmed it, but dipped the bowl in six inches deep, and took a bowl full out like this (*illustrating*); and supposing I had a tap in the bottom of the can, then if I drew out a gallon from the bottom and dipped a bowlful off the top, I believe there would be as much difference as between the fore milk of the cow and the latter milk—the one would be 1 per cent. and the other 11 per cent. A great many people in dealing with milk sent to London do not mix, say, a gallon out of the bottom with the milk off the top. I know a man in my neighbourhood the other day did the very same thing. It was a long way above the usual standard. His milk was in one or two churns, and the other was regular skimmed milk. He did it just in the same way as this was, or somebody else did; he did not always do it himself. I suppose his milk if it had been all mixed together would pass the standard still.

5253. Do you think it would be a great hardship to insist on the farmer doing that?—We all try to do that, but you know you cannot be at every finger's end, and then by-and-bye you get caught, you see. I suppose I never was caught, but you see you would not get caught if the whole lot was mixed again by the people who take a sample, and if they insist on the whole bulk being put into one thing and mixed up well before the sample was taken—which ought to be done.

5254. Could not the farmer do that at his own farm?—Yes; we do.

5255. You leave it in a vat?—Yes, we stir it up, but perhaps it is not stirred enough. You know how it is done by other people; little mistakes are made, and you are laid open to it.

5256. These are tricks of the trade which, after all, anybody who goes into the business ought to learn to deal with?—If a man can come forward and explain these matters I do not think he ought to suffer a conviction.

5257. It helps to save him against conviction?—This man was convicted the other day and fined heavily.

5258. It will be a lesson to him?—Yes.

5259. (*Mr. Barham.*) Was that the man who was fined £40?—No, I do not think he was fined as much as that. He has fourteen children, and could not pay £40, I think.

5260. (*Chairman.*) Of course, you cheese makers sell very little milk?—I sell milk, if the trade is good; from the middle of September very often I begin selling, but generally speaking, unless we get an abnormally dry season, I do not begin to sell perhaps till a fortnight in November, and then I go on until the 1st of April.

5261. That milk would be pretty good milk, because you are not then coming down to the spring?—I should not hesitate in saying that my milk in October and November possibly would be 3·50 or 3·75.

5262. The cheese people would be selling their milk at the time of the year when really the milk is more likely to be rich?—It would be so before Christmas, but after Christmas it begins to get poor when you have the cows calving in February.

5263. After calving, yes; but then after calving you want the milk for your cheese?—We sell a month or two after. I sell my supplies—I may have a few in February, March, and April; I do not think mine now would be over 2·75. I feed fairly well. If you feed too high you produce quantity and not quality; you lose the quality a lot if you force the cow. You must not go feeding too high, else you make a mistake there. I was noticing the other day at the London Dairy Show—I think I have the figures here for eight years—that out of 132 cows they had thirty-nine below 3 per cent.

5264. We have, I hope wisely, said we will not take any figures from dairy shows, because the cows are not in a normal condition there; the excitement and worry of the new conditions upset them?—That is so.

5265. So that they cannot be looked upon as normal?—What I have here would be a summary of the analysis from our dairy shows, but the tests for the last two years have been shown on the farms.

5266. Are these figures taken from cows milked on the farms?—In 1898 and 1899 they were.

5267. The figures you present are figures taken from the cows milked at the Bath and West of England, or at the London Show?—They were milked at the London Dairy Show.

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5268. What about those you have just mentioned?—Those were at our Society, the Evercreech and Mid-Somerset.

5269. Were they in the show?—They were in the show until 1898; in 1898 they were milked on the farm.

5270. Have you got the statistics of those two years separate from the others?—They are milked once on the farm.

5271. What do those figures show?—In the morning they show 3·3, 3·7, 4·1, 3·4, 3·0, 4·1, 3·1, 3·6, 3·3, 3·4, 3·0, 3·1, and 3·1. Then the Jerseys went to 4·4, 4·6, 4·7, and 4·3; that is on the farm.

5272. That is morning's milk?—That would be morning's milk; that would be thirteen hours' milk.

5273. And they were all over 3 per cent.?—Yes. That was in the very latter end of August. The show was held about the 5th September, and that was the week before. You see they varied a lot. When they were milked in the show ground they went back.

5274. We would rather not enquire into those at the show; they may show anything?—All these cows were fed to get the milk pretty rich.

5275. I should think all milk-sellers do that?—When you come to September and October that is where the fixing of the standard comes in so wrong. It throws up a much higher percentage of cream than it does in May and the beginning of June.

5276. Of course it has a lot to do with when they calve?—If you have a cow calving in August, you would not show a high percentage in September.

5277. (*Mr. Barham.*) Do you suggest that no standard should be fixed?—2·75 I think would cover it at any time of the year. I should not be afraid of 2·75, and I do not think anybody would about us. They think that could be done the whole year, but not higher.

5278. You think if the cows do not give that the farmers would be prepared to take the consequences?—Yes, that is their opinion. I think you must look to your cows and get rid of them if you have got any that would not be up to this.

5279. Then you suggest—I do not know that we need go into that—that the milk should be mixed at the London station?—I say the milk ought to be taken at the departure station. It is tampered with; you see so many cases of its being tampered with by the railway officials and so on.

5280. You are aware that the dairyman in a large town is responsible until he has delivered it to the consumer, or rather until he has delivered it to the purchaser?—It generally falls back on the producer, I fancy that is the man that has to suffer.

5281. Somebody must be responsible for the milk between Bristol and London, for instance, or between your sending station and London?—Is it not the producer as a rule?

5282. The producer now, but you are suggesting that the retailer should be responsible for it, I understand?—Yes; the samples should be taken at the departure station.

5283. Cannot you see any objection to taking the samples at the departure station?—No, not from the producer's point of view.

5284. True; I mean from a fair point of view. I suppose it would be necessary in order to take a sample of your milk early in the morning for the inspector to arrive at your station by the train the afternoon or evening before, would it not?—Quite so.

5285. He would have to put up at some public house or somewhere near; he would require a bed?—Yes.

5286. The chances are that you and your man would get to hear that he was down there, and the object that he would come for, and if you wanted to do a thing that was not quite right you would take care not to do it that morning?—I do not think it would get about, I think it would be quietly done. I think that the business would be managed better than that.

5287. I do not want to give you more information than is absolutely necessary, but there has been a case recently decided by one of the magistrates who gave it as his opinion that it was not fair that the sample should be taken from one churn, but that the sample should be taken from the whole consignment?—That is my impression.

5288. I do not agree with it myself, but I think a farmer should take care if it is necessary in some cases where the night's milk is not sent away till morning to have it thoroughly mixed, and to have a fair sample in each churn; that could be done on the farm, but you can quite see yourself that it is not possible for it to be done at a London station?—There would be some tub or some receiver to put it in.

5289. You would not like your milk put in to a receiver which had contained milk from some other farmer that might be more or less sour, would you?—We must put up with that sourness for the time being to get the thing fair. We always find, as the last witness said, the evening's milk a little bit better than the morning's, although I milk regularly. I milk at five in the morning and four in the afternoon, and I always find there is a difference in the night's and morning's milk, but not to the same extent as we were saying—it may be two or three, or four points, or something like that.

5290. Do you milk twelve hours and twelve hours?—Thirteen and eleven is about as near as we do it.

5291. (*Mr. Cowan.*) How many cows have you in your herd?—Forty.

5292. All Shorthorns?—Yes.

5293. You seem to advocate a very low standard of milk. Have you ever found it to come below three per cent. in a mixed herd like yours?—That is somewhere about it; I do not think I have ever had it below. I have had it just on the verge, but I cannot say conscientiously that it has been below.

5294. You are a cheese-maker?—Yes.

5295. Of course I am aware that the cheese-makers work their dairies differently to what those do that are sending milk into the towns?—Yes.

5296. Your cows will calve mostly in the spring of the year for cheese-making purposes?—A great number of them calve in March.

5297. Of course, the milk produced by those cows is very seldom sent into the towns by those who make cheese?—It may be sent in through the months of March and April.

5298. April? So long?—Sometimes; this year my milk is still going.

5299. So far as the cheesemakers are concerned, I do not suppose you have any difficulty in having your milk considerably above 3 per cent. during the winter months?—It would be above 3 per cent. during the winter months; I think from September on it would be somewhat above 3 per cent.

5300. Why do you advocate 2·75? In whose interest would it be?—In advocating 2·75 I am taking the whole year. If you fix as a standard 2·75 you want milk with 2·75 in May and the beginning of June.

5301. I understood you to say that those who produced milk have their cows calving at different seasons of the year—of course, to suit their purposes?—Yes, those people that send away milk all the year round.

5302. They have no difficulty?—They would not have any difficulty; the difficulty would come in more with the cheese-maker.

5303. I understand you do not send your milk in at that time; I do not think you ought to take that into account at all?—We may or may not; I am sending milk now.

5304. Do you not think it would leave an opening for what I see you state at the end of your *précis*—that is, in taking milk to the station you have found that it has been taken out, and also in transit it has been taken out?—Yes.

5305. If there was a higher standard fixed than what you suggest, would it not act as a preventative against being taken out in transit?—I do not know, I am sure; those people that steal the milk would not know much about the standard.

5306. No, nor care. You advocate strongly that the producer should not be responsible for the milk after the place of delivery?—Yes, I do.

5307. When it goes out of his hands you think he should not be at all responsible?—I do not, after it goes into the railway company's hands.

5308. If the producer is to be responsible, from your point of view the inspector should take a sample of his milk at the place of deliverery or on the farm?—

Yes, either at the place of delivery, or probably the best place would be to take it at the departure station, I should say.

5309. Are you quite fixed in your view that 2·75 is a high enough standard?—I am, and the Society the same; they feel that plenty high enough—as high as we can naturally expect it. You see everybody has not got the pocket to feed cows, even to give them a normal feeding.

5310. Do you think feeding improves the quality very much?—It does if you do not over-feed—say, just five or six pounds of cake a day would improve the quality, but if you over feed I believe you get a greater result as far as quantity goes; but I think the quality gets less.

5311. Have you not found it always to come back with feeding—that it may rise for a certain length of time, but it always comes back to its normal quality even with extra feeding?—Do you think so if you over feed them?

5312. Yes?—I do not like over feeding.

5313. Have you ever taken any notes about that?—No, I have not. It is all hearsay from one or two I know that have done it.

5314. (*Dr. Voelcker.*) You speak in your *précis* of some of your fields differing from others; that is only a matter of general belief, I suppose, and you have nothing to absolutely show it?—Yes; I have a field where you can get seven or eight gallons of milk less per day.

5315. That is quantity; I am speaking of quality?—Still we know about quality because the same quantity of milk does not produce the same amount of curd on that land.

5316. Curd is one thing, but when you are selling milk to the public the curd is not the chief ingredient one bears in mind, is it?—It is a solid; one follows the other generally, I suppose.

5317. You could not say that one of your fields produced more butter-fat than another?—No, I could not. It has never been analysed. It is a well-known fact that they do differ field to field.

5318. Is your statement quite correct that the longer the period of lactation is the better the milk is?—I am quite certain of that, because I have just tested a lot of my cows now, and I have found it to be so. I have found my cows calved in October at the present time up to 4 per cent., but the cows that calved a fortnight or three weeks later would not go anything like 3 per cent.; I had one or two cows calved in October and November that I showed.

5319. It gets better as the cow gets towards drying?—We always find that. That is the reason why fall milk is better than spring milk.

5320. You are speaking from the point of view of the cheese maker?—No.

5321. (*Chairman.*) I thought what you are stating was a recognised thing?—It is a recognised thing quite. The longer a cow is milked the better the milk is; the smaller quantity she gives, but you get better results in butter fat. I have tried it all my life.

5322. (*Dr. Voelcker.*) That is so?—It is a well-known fact, known by everybody.

5323. With regard to a portion of the milk being left in the udder, if that were done you would get the milk that was sent out for consumption poorer in quality?—Yes, it would be so.

5324. Why should the public suffer?—I do not know at all why I should suffer either, because I could not help it.

5325. You are responsible for it?—I am responsible in a degree. I suppose you are responsible for what your servants do.

5326. The position of the farmer is no different to that of any other person in a responsible position?—But it shows how you are robbed, and you are robbed in a way that you cannot seem to remedy it; you cannot remedy the evil.

5327. Sometimes you cannot be there to look after it?—Even if you are there you cannot prevent it. I always milk myself regularly, and I could not tell if it was being left in. I could tell if it was left in in one quarter, and that quarter being heavier than the rest; but if they left those strippings in I could not tell, unless I got under the cow, and tried her myself; and still having no thought of it I should not do it.

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5328. Still the milkers know of it?—We are always telling them of that.

5329. Is there any practical difficulty in mixing the milk before it leaves the farm?—Milk buyers do not like the night's and morning's mixed at all; they always like it to go separately.

5330. If you have got cows in a byre, and you get a churn and fill it up, is it not quite feasible to divide the milk of different cows between different churns?—So that one churn should be better than the other one, do you mean?

5331. No, I mean that you can so arrange that every churn shall contain the milk of several different cows?—Yes.

5332. That is quite feasible?—Yes. That is how it is always done.

5333. What sized churns do you pour the milk into when you send it away?—It is what they term eight barns, that would be 17 imperial gallons.

5334. In your experience the milk of how many different cows goes into one churn in the ordinary course?—One man may milk, say, three cows, another may milk three, so there may be six cows, you see put into it.

5335. As a rule, would there be the milk of about six cows?—Very likely, it is put into bulk, and measured afterwards. It is all put into one tub, and taken out directly afterwards; it is done in that way to get it strained.

5336. You have suggested that when samples of milk are taken at the stations the contents of the different churns should be mixed together?—I have, and well stirred; it would not be fair else.

5337. Does it not strike you that it might be quite possible for a farmer to send up a churn of separated milk along with the rest?—There is no farmer about us that has a separator; nobody separates about us.

5338. Still you could imagine quite well that if the contents of the different churns had to be mixed together a man wishing to defraud could send up a churn of separated milk along with the others?—If that separated churn of milk was put in with the others it would lower the standard of the others.

5339. It would, but if they were sufficiently high in quality themselves it would not matter?—I believe it is done in some places—I have always thought so—along at the fall of the year when we have a very high standard. I believe that to be done by some people.

5340. Do you not think that the fixing of a standard higher than you have suggested would act as a deterrent?—I do not think that in the spring of the year we can meet anything higher than 2·75, through May and the beginning of June for six weeks.*

5341. Though it might be very much exceeded at other times of the year?—It can be exceeded at the fall of the year, even with cheese-making dairies. With any other kind of dairy I believe you could not go higher than that.

5342. (*Professor Thorpe.*) You represent as you have told us the Evercreech and Mid-Somerset Agricultural Society?—I do.

5343. Has the proof which you submit been submitted to the general body of this Society?—It has to the executive.

5344. May we take it that it represents also the views of the executive?—It does represent the views of the executive; it was put before them.

5345. May I point out to you that you put forward a set of considerations which apparently are designed to affect the judgment of this Committee in fixing a low standard, which strictly speaking I venture to think are not relevant to the question? Of course, we have to suggest a standard that has a reference to what we may call the normal condition of supply—is that not so?—Yes.

5346. Therefore I venture to say that such considerations as tampering with the churns by farm servants, tampering with the churns by the railway companies' servants and carelessness on the part of the milker, are not strictly speaking matters that we in fixing a standard ought to take into consideration?—Perhaps not, but it shows that we are in the hands of unscrupulous people.

5347. It is true, but then may I point out to you that certain of those things, for example, the carelessness

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* The witness subsequently wrote: "I think after the months of April, May, and June, it may be fixed at 3 per cent. These are the poor months."

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of your milkers, the delinquencies of the man conveying your produce to the railway stations are matters entirely within your own administration, are they not?—Well, I suppose so; it is nothing that you can alter much, and I do not see that I can alter it.

5348. But surely you cannot ask that the general character of the milk supply of this country should be altered to meet that?—Certainly, I could not ask you to put the standard lower through these robberies. The only thing I should like you to do is to hear, of course, what ought to be said in the matter if the producer should be summoned. It should help to screen him if he could prove to the court that this milk had been tampered with.

5349. But this class of considerations does not affect any other trade does it? I mean a man who is, for example, brought into a police court for selling margarine, when he ought to have sold butter, does not plead that his servants substituted margarine for butter, does he?—That is done with the man's eyes open.

5350. I mean to say the Bench does not naturally suppose that the man is excused because his servant did wrong?—No, I suppose he is liable for what his servant did.

5351. Therefore, I venture to think that those considerations are not strictly relevant to the question of the fixing of a standard; do you agree with that?—Perhaps not; I do not say they are. It shows how we are treated, and what unscrupulous hands we are in with railway servants, and our own servants, too.

5352. Now, taking the question of the railway servants, I venture to think that the management of your own servants is a matter entirely within your own control. You plead, however, that you suffer from the misdeeds of the railway companies' servants?—I have not myself, but I know people that have.

5353. You say in your *précis* that the railway companies insist on unlocked churns?—Yes, I have said so because you see it is sent by the barn gallon. They want to look in and see that your quantities are right. Perhaps you would send fifteen gallons or eight barns, and say you had five barns or something of that perhaps they would think.

5354. You send up your milk I presume by the London and South Western?—I do not send my milk to London at all. There is a buyer who buys several dairies, fifteen or twenty dairies round our neighbourhood, and he sells accommodation milk—if the trade is good he sells it. If not, he makes what they term Caerphilly cheese—a cheese that goes into Wales for the colliers.

5355. Then this question of locked churns does not affect you?—It has not up to now; I may not always sell my milk perhaps.

5356. He would send this milk then to a very large extent by the Great Western?—By the South Western always; I have known him send a hundred churns a day.

5357. Do you know that the London and South-Western absolutely forbids the locking of churns?—He tells me that they will not have any locked churns.

5358. You have not seen possibly any recent correspondence on the subject?—No, I have not.

5359. In that correspondence the companies say that they have no objection to the locking of churns?—I have not seen that, but I think I saw in the paper since I wrote my *prècis* something about it—that the companies had no objections.

NINTH DAY.

Friday, 6*th April*, 1900.

PRESENT:

Lord WENLOCK, G.C.S.I., G.C.I.E. (*Chairman*).

Mr. GEORGE BARHAM.
Mr. GEORGE COWAN.
Major PATRICK GEORGE CRAIGIE.
Professor T. E. THORPE, F.R.S.
Dr. J. AUGUSTUS VOELCKER.

Mr. R. HENRY REW, *Secretary*.

Mr. J. FALCONER KING, called; and Examined.

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5360. (*Professor Thorpe.*) You are Public Analyst for the City of Edinburgh and other towns and counties in Scotland?—I am.

5361. You have held office since 1873?—I have.

5362. Longer indeed than any other public analyst in Scotland?—That is so.

5363. And consequently you have a large experience in the analysis of milk in connection with the Sale of Food and Drugs Act?—I have.

5364. Are you of opinion that it is absolutely necessary that a standard should be fixed both for milk and for cream?—I am decidedly so.

5365. Why are you of that opinion?—Taking my own place, Edinburgh, if we do not have some standard fixed, the Act will very soon become a dead-letter as far as milk is concerned because our Sheriffs are of opinion that unless a standard is fixed, or unless some person has seen the milk actually adulterated, or the evidence of the public analyst is totally uncontradicted they will not convict. I had a case not very long ago in which the fat was about 2·1 per cent.; an analyst appeared on the other side, and said that he could not say that this milk was adulterated. The result was the Sheriff found the case "not proven."

5366. But then your experience in Edinburgh must be somewhat singular?—I think it is quite unique. We are sitting under the shadow of the Supreme Court there, and our Sheriffs seem to think that there is no legal proof of adulteration unless an analyst would say that this milk is certainly adulterated, and they can get no one to contradict him. I have lost several cases in that way.

5367. Do you wish the Committee to infer that an analyst, who, I understand, does not contradict your analytical figures?—No.

5368. Will go into the box and say that in his judgment a milk which contains so low a percentage of fat as 2·1 is not adulterated?—What he said was that his analysis substantially agreed with mine—that there was no substantial difference between the two. But he said to the Sheriff that he could not say that this milk was adulterated; that is how he put it. The Sheriff says: "Well, here is one man tells me the milk is adulterated, and the other says he cannot say it is adulterated. No one saw the adulteration taking place, and there is no legal standard fixed to guide me; therefore I dismiss the case." That has happened twice quite recently.

5369. It is that experience then which leads you strongly to suggest that some standard must be established by regulation?—That is so. If we had a legal standard fixed all our difficulties would disappear, and our Sheriffs, I am sure, would be very well pleased.

5370. Are we to understand then that as regards milk it is not possible to get a conviction in Edinburgh on a question of adulteration?—That is if you have an analyst on the other side who will say that he cannot say this milk is adulterated. That has been the result in the late cases.

5371. Then has your Committee declined to take cases into court?—No. The Sanitary Inspector, Dr. Williamson, is a very good officer, and he does his duty thoroughly well, and brings those cases into court; but that is just the result, and he might as well not do it.

5372. You are of opinion also that it is desirable that there should be some standard apart from the unique position in which you stand with regard to your own Sheriff in order that there shall be uniformity in the mode of reporting by all analysts?—I think so.

5373. What have you to tell the Committee with respect to the standards which this Committee should recommend?—I think the standards upon which you would get the greatest amount of evidence are those adopted by the Society of Public Analysts, namely, 3 per cent. for fat, and 8·5 per cent. for solids not fat. I think that is a very fair standard indeed; I certainly do not think it should be lower than that.

5374. Are you of opinion that it might be raised?—Perfectly; I think it might be raised to 3·25 quite well.

5375. Are your suggestions confined solely to the fat?—I think 3·25 of fat and 8·5 of non-fatty solids would be a very fair standard.

5376. (*Dr. Voelcker.*) I beg your pardon; what did you say?—From 3 to 3·5—3·25 possibly for fat.

5377. (*Professor Thorpe.*) You would prefer that the limits should be fixed in that way rather than that they should be fixed on the total with a defined proportion of fat?—Possibly that would be the better way to fix it on the total solids, and then if the fat was excessive so that the non-fatty solids were brought down below 8·5 I do not think that should be an offence. For instance, if you had total solids of 12, and your fat was 4 or 5, then, of course, your non-fatty solids would be below 8·5; but I do not think that should be held to be an offence. I should say that the fat is the principal thing, and it certainly should not fall below 3 per cent., and the non-fatty solids should not fall below 8·5.

5378. I think it would be desirable that we should get your recommendation clearly on the notes; of the two systems suggested which would you prefer?—I would prefer the one we have at present, that is to say the solids not fat, and the fat; but I would certainly say that if the non-fatty solids fell below 8·5 per cent., by reason of the fat being above 3·0, I would not consider that an offence.

5379. In other words, you would take an excess of fat as compensating for a deficit in non-fatty solids?—I would.

5380. Why, may I ask, do you prefer that way of stating the limits to the alternative?—I think it is more definite, and we have had it for so many years now that everyone who has worked with this subject has got accustomed to it.

5381. Is it your opinion, based upon your experience, that there is a good deal of tampering with milk in your part of the world?—I am afraid there is either before the milk comes from the cow or afterwards. In Edinburgh they have got into the way of feeding with refuse from breweries and distilleries. This gives a very large quantity of milk, but it is of poor quality.

5382. What character of adulteration is practised with the milk?—The evening milk is allowed to stand until the morning, and then cream is taken off, or a part of the cream is taken off, and the residuum of partially skimmed milk is mixed with the morning's milk, the result being that in some analyses I made not long ago I found that the morning milk from the same herd of cows—and taken, I believe, very fairly—was very much poorer than the milk which was supplied in the middle of the day—what they call the forenoon milk; it was very much poorer in fat.

5383. Is abstraction of fat then the main form of adulteration which goes on?—Yes, almost the only one. I think my experience is different from that of the English analysts, because I do not find adulteration with water at all common. I have a case now and again, but I think that is rarely practised in Edinburgh.

5384. Is the City of Edinburgh mainly supplied with milk by farmers or by vendors—milk companies in the city?—There are not many milk companies in the city. It is principally supplied by smaller people. A peculiarity of Edinburgh I think as regards the milk supply is that many of the cows are living in the town.

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5385. Do the owners of the cows directly sell the milk to their customers?—Not in all cases—they sell it through dealers; they sell wholesale, and then the dealers dispense it in small quantities.

5386. Are you aware if such dealers purchase separated milk?—The small people? The retail dealers?

5387. Yes?—I do not think they do; at least it is not within my knowledge.

5388. Is separated milk sold at all to any considerable extent in Edinburgh?—I do not think it is. I think it is sold for dietetic purposes. It is sold, I believe, for baking to the large biscuit manufacturers. I believe they buy large quantities of skimmed milk for the purpose of manufacture; but I do not think much skim milk is used in Edinburgh by the people.

5389. Have you any experience of the terms of contract of the companies in Edinburgh?—Yes. Our largest company, the Edinburgh Milk Supply Association, lay down certain standards for the milk they are buying. Their standard is 3·5 for fat, and the manager informs me that he has not the slightest difficulty in getting any amount of milk of that quality. If the milk comes over this in fat he gives them a little extra—about a half-penny a gallon, or something like that; if it falls to 3·25 he takes a half-penny off, and if it falls below 3 he will not have it at all. He only pays somewhere about 9d. to 10d. per gallon.

5390. Has he any difficulty at any particular part of the year in keeping up to that limit of 3·5?—No; he tells me he has not the least difficulty in getting milk of that quality at that price.

5391. (*Chairman.*) Does he get his milk from Edinburgh or mainly from the country?—I think mainly from the country.

5392. (*Professor Thorpe.*) Is the retail price of milk in Edinburgh affected by its presumed quality?—No, I am afraid it is not, unless among the better class people, who go where they think they will get better milk. The great bulk of the milk sold in Edinburgh I am afraid is sold quite irrespective of its quality.

5393. And at a fairly uniform price?—No, it varies very considerably. This company of which I speak I think get from 1s. 1d. to 1s. 2d. a gallon, but there is another company, I believe, selling it very much cheaper. They go on ready-money principles, and they sell milk at somewhere about a penny a gallon profit—something like that. A large amount of the milk in Edinburgh is sold by very small people. Many who have failed in other trades take up this milk trade; it does not require very much capital to start it. I think there are a large number of people of that kind in Edinburgh.

5394. Have you any difficulty in getting authentic samples in the exercise of your duties as public analyst?—Are you referring to the samples taken by the officers?

5395. Yes?—No, I do not think they have any difficulty; at least I have never heard of any difficulty. Once or twice the inspectors have caught men with two cans on their cart, in which we have found different kinds of milk. I had two cases quite recently in which the inspectors for some reason suspected their man, and they got a sample of milk from him. He knew who they were, and this milk came out really very good; it turned out to be so. But they followed him with his cart where he was delivering the milk, and when he had delivered some at one of those smaller dealers they went in and got a sample of that, and it contained about 40 per cent. of water. The inspector noticed that the man had two cans, and he had some difficulty in getting this second sample; however, he got it from the people to whom this milkman had sold the milk. I had another case in which there was not quite so much difference, but very nearly the same difference, in the two cans that the men had.

5396. (*Chairman.*) Was that man prosecuted?—Yes.

5397. Was he convicted?—Yes, he was fined £10.

5398. (*Professor Thorpe.*) You make a suggestion that milk might be sold according to its richness as disclosed by analysis?—Yes, I think that would be the fairest way of selling milk, but I am afraid it would be impracticable. I do not see how it could be done. But as milk is a substance of variable quality, I think that would be the fairest way of selling it.

5399. No doubt it would be the fairest way if it were practicable; but I presume it would scarcely be practicable in the bare form in which you state it; but might it be practicable in a somewhat modified form that milk

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might be graded and might be sold of certain standards of quality as represented by the fat?—That would be much the fairer way of doing it.

5400. Do you see any difficulty about doing that?—I daresay in many towns there would not be much difficulty, but I am afraid there would be in Edinburgh, for the reason that I have stated, that the milk trade in poorer localities is very largely in the hands of small people. I do not know how you could trace the milk from the wholesale dealer to those people to make sure that they were selling a milk that belonged to a particular class. You would require to have the cans labelled or sold under supervision, or something of that sort.

5401. Have you anything to tell the Committee from your experience as to the natural variations in milk?—I have got milk containing quite 6 per cent. of fat, and I have got milk which I have been told is genuine—I never got it myself from the cow—but I have got it down to about 2·5 per cent. of fat. From some of the country towns for which I act as analyst I have had milk with quite 6 per cent. of fat.

5402. Would that be morning or evening milk?—I really cannot say; it was milk sent by the inspectors.

5403. (*Chairman.*) Would it be milk from a single cow or from a herd?—I rather think from a herd of cows; I am almost certain. I refer to the town of Alloa, from which the inspector sent me that particular sample of milk.

5404. (*Professor Thorpe.*) You have told us of the conditions under which milk is produced in Edinburgh. Is there much milk produced in Edinburgh as the product of a very few cows?—I do not think so. I think the milk is produced in Edinburgh, that is within the city, by large dairymen. They have such an enormous amount of this product from breweries and distilleries. They seem to use that largely, and I think that is the reason why Edinburgh is different from other towns in having so many of the cows inside. They can get this stuff so very readily. Of course, it is wet and bulky, and costs some money to carry it any distance, but they get it just close at hand. I think that explains partly, at all events —why so many cows are kept within the city.

5405. Are those cows fairly large herds or are they small in number, and kept by small people?—The small people are those who retail; I think those that are kept by the producers are fairly large herds.

5406. Then we may take it that the milk supplied to Edinburgh is practically the mixed milk of herds?—I think so.

5407. You are aware, of course, that the quality of the milk is affected to some extent by the interval between the milkings of the cow?—I believe it is, but not nearly to such an extent as I was led to believe from those experiments which I have been making. I have received information since which leads me to believe that the morning milk with which I had been working was not really genuine, but was obtained by a process rather common in Edinburgh, namely, mixing the morning milk with the partially skimmed milk of the previous evening. I found an enormous difference, somewhere about 1·5 per cent. of fat, I think, between the morning milk and the forenoon milk, but I have reason to believe now that I had been working on samples prepared in that way, and that the forenoon milk was what I call a genuine milk, and that the morning milk was the milk from the cows in the morning mixed with the milk of the evening before, from which some of the cream had been removed.

5408. I suppose from the circumstance of the cows being adjacent to or within the city of Edinburgh, it is mainly a warm milk trade which is done in Edinburgh?—Largely, I think.

5409. The fact that the cows are so to say close to the city ought to make it relatively easy to arrange the times of milking at something like approximately equal intervals?—I should think so. I believe the times of milking are about 4 to 5 in the morning, about 11 forenoon, and about 5 or 6 in the evening.

5410. What on the average is the interval of time between the two milkings?—I should say 10, and possibly 5 or 6 hours.

5411. But that does not account for the 24?—The cows are milked in the evening, then they are milked next morning, and then they are milked in the forenoon.

5412. (*Chairman.*) Three milkings?—Yes.

5413. (*Professor Thorpe.*) Is that usual in Edinburgh?—I think it is.

5414. (*Dr. Voelcker.*) Do I understand that when a case is brought before the Sheriffs they are guided entirely by the opinions of the analysts?—I think they are largely guided.

5415. Have they no idea themselves of what standard ought to be fixed for milk?—They have complained, if we may call it complaining, they have said again and again that there is no legal standard, and they have nothing to guide them; they have told me just as plain as words could say, without saying it directly, that unless the evidence of the analyst is quite uncontradicted, or unless there is some standard instituted by some authority, they will not have any more convictions.

5416. Have they no acquaintance with the standard of the Society of Public Analysts?—I have told them again and again of that standard. I have told them how it is arrived at by the analysis of thousands of milks.

5417. But they are not guided by it?—No.

5418. Is this the result of the Scotch verdict of "not proven"?—No; I think they would say "not guilty"; I do not think they would convict.

5419. I mean, is a case dismissed on the ground of the person accused being not guilty or on the ground that the case is not proven?—The Sheriff usually says, I find the case "not proven."

5420. So that in some ways that form of verdict has to do with the occurrence?—The Scotch verdict of "not proven," frequently means, we think you are guilty, but we can't prove it.

5421. (*Mr. Barham.*) Then you have two descriptions of verdicts in Scotland, have you?—We have three—"guilty," "not guilty," and "not proven."

5422. (*Dr. Voelcker.*) Then the difference of opinion is on account of the difference of opinion of the analysts, not on account of the divergence of analytical results?—Yes. There is a gentleman in Edinburgh—I do not know that I should mention his name.

5423. I was going to ask you something about that. Can you in any way account for the difference of opinion between analysts in such cases?—In Edinburgh the gentleman who appears against me is Dr. Drinkwater, who is the analyst for some milk association—I do not know which one; it is an association of milk sellers. He it is who comes and says that he cannot say this milk is adulterated.

5424. Do you mean to say that he is a regular advocate of the low qualities?—He comes up whenever I have a case—at least very frequently—and that is the result.

5425. Is it maintained by him or other analysts who appear against you that the quality of the milk as shown in your analyses is such as can be naturally produced by a cow?—I think he does not go that length. The Sheriff puts the question pointedly, "Is this milk adulterated in your opinion?" He says, "I cannot say that it is."

5426. This obliges you to take a low standard before you report a milk as being adulterated?—I stick to my own standard, with the result that we lately have got few convictions.

5427. If you bound yourself implicitly by such a standard as that of the Society of Public Analysts you would have no chance whatever of carrying a conviction?—No, not as long as this gentleman appears against me. Two of our Sheriffs have decided cases lately, and they both gave the same verdict.

5428. So that when you have a case where you believe a milk to be adulterated, in judging of that you are practically forced to adopt a very low standard?—I do not know what standard I would require to adopt. It seems to me I would require to go down almost to nothing at all. If a man says that he cannot say that milk is adulterated when it contains only 2·1 or 2·2 per cent. of fat, I do not know how much further he may go; if he goes down that length he may go down to anything.

5429. I take it that you will only report on a case of adulteration when you are absolutely convinced that there is a chance of its being carried through?—I do not understand your question quite.

5430. You would only report on a case of adulteration if you were absolutely sure, after taking a low standard as your basis?—I would only report it if I took a low standard.

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5431. Yes?—I have taken this standard of 3 per cent. ever since it was adopted by the Society of Public Analysts. My difficulty is to know what standard to take. I have never spoken to Dr. Drinkwater on the subject, because I think perhaps I had better not, but I would like to ask him whether there should be any standard at all.

5433. (*Dr. Voelcker.*) Have you heard it stated that there are many discrepancies between analysts?—I do not think so. Do you mean in the results of analyses.

5434. Yes?—No. Dr. Drinkwater generally says that his analysis agrees substantially with mine; I think it is only in the inference that the difference is; the analytical results generally agree.

5435. May I take it from your answer to Professor Thorpe that you have not fully gone into the question as to whether it would be advisable to state a standard in terms of fat and solids not fat or total solids including so much fat?—No, I really am not so particular about that. If you give us a standard I do not care what it is, but my work is of little use just now as regards the principal article of food in Edinburgh.

5436. Is your preference, as stated, for fat and solids not fat, based upon the fact that you have been accustomed to such standards?—Yes, and the standard has worked very well in time past.

5437. It is better known, and has worked well?—Yes.

5438. Have you gone at all into the question of the other constituents—say the ash of milk and the nitrogenous constituents?—I have not done much with the nitrogenous constituents, but I think the ash is a very important assistant.

5439. Do you ever use those determinations for the sake of deciding in doubtful cases whether a milk is adulterated or not?—I have not.

5440. Practically, you have not used them?—When I bring a case I want to be perfectly sure, and to take a very safe margin. If it comes a little below 3 or a little below 8·5, I do not take it; I say, This milk is low, but perhaps the case should not be prosecuted.

5441. But you would believe that you might have a milk coming up to the standard, and yet be made up fraudulently, whereas further chemical analysis, including determinations of the ash and nitrogen, would show what the nature of that adulteration was?—Quite. If I had any suspicion of that, I would certainly further investigate it.

5442. Do you think it would be possible to introduce into any standard further provisions implying the use of these further determinations in doubtful cases?—I do not think you could fix them so strictly. I think it would be very difficult to fix a standard with regard to ash.

5443. You mean they would be more help to the analyst than they would be to the general public?—Precisely. The analyst can put all these things together and consider them.

5444. The analyst himself would consider these things?—Yes, certainly.

5445. You do not think it would be possible to give them legal significance?—I am afraid not.

5446. When you have reported on a sample as being adulterated, are you ever asked to advise as to whether a prosecution should be instituted?—When Sir Henry Littlejohn had charge of this department he and I used to work together in a friendly way, but I do not think I can ever be said to be officially consulted on the subject.

5447. You are not officially consulted by any Committee?—No, I am not.

5448. But whether action is taken or not, is generally decided in consultation between yourself and Sir Henry Littlejohn?—Yes, when he was in charge of this department he used to ask me to express an opinion as to whether certain cases should be prosecuted.

5449. Would your position be a firmer one if you simply had to give the figures of analysis, and to leave the Sheriffs or other officials to decide as to whether a prosecution should take place?—I think it would. It would be more preferable, certainly. I would much rather have it that we simply give the result of our analysis.

5450. That would get you out of the difficulty that you have mentioned to us that you have with other analysts?—It would.

5451. Speaking for analysts generally, would you think their position would be improved?—If the figures are merely to be stated?

5452. Yes?—I think so. I do not think an analyst should be asked to decide whether a milk is adulterated or not—at least, not in the way we do at present. I think he should simply give his figures, and then the Sanitary Authority should compare them with the legal standard—a standard laid down by some responsible body—and they should decide themselves as to whether a prosecution should follow or not.

5453. I put to you a case where the solids, not fat, fall just below 8·5; if you had a standard of 8·5, and the case came before the Sheriff, he would say, "That comes below," yet an analyst might tell him that it did not necessarily mean adulteration?—Yes. I suppose the analyst could in certain cases assist the legal authorities. I think he could, but it would be a much more dignified position, I think, for an analyst to be placed in, if he simply had to make an analysis of the milk.

5454. And left the results to be dealt with by other bodies?—Precisely.

5455. You speak of a prejudice against milk because of its poor quality; is there anything to bear that out? What leads you to think that if milk was of a better quality there would be more used?—Among the better classes I think there is no doubt of that. If one is certain that an article of food is pure I think there is little doubt that he will use more of it than if he were doubtful as to its quality. I know in my own house that would be so.

5456. I suppose that is because in your special case at Edinburgh, you know, on account of the failure of prosecutions, that milk of a very doubtful nature goes through without a check?—It is, of course, when you are dealing with poor milk that you want better milk to get a larger sale. If you are getting fairly good milk I do not know that making it any better would increase the sale very much.

5457. When you advocate the grading of milk, and mention the various prices that are paid, varying, I think, from 1*s.* to 1*s.* 2*d.*, is one to gather that the higher prices are paid for the milk of vendors who have better reputations, generally?—I am afraid I have, perhaps, misled you. There is no grading at present, but I suggested you might have that.

5458. But milk is sold at different prices?—Yes.

5459. Do the vendors who have the better reputation get the higher price?—I suppose they do, but there are other things which come in. For example, if you take this Milk Supply Association in Edinburgh, that do a credit trade largely, you will find that they are dealing with richer people, and they have quarterly accounts, I think. But here is another company, who do a very large business, and they call themselves the Cash Milk Supply. Then you pay for the milk as you get it; you buy a pennyworth, and you pay as you get it. They need have no books, and they sell it much cheaper; they sell it, I believe, for somewhere about 1*d.* or 1½*d.* a gallon profit, whereas those other people, apparently, from their own statement get from 3*d.* to 4*d.* a gallon.

5460. You would not say there was any correspondence between the higher price and the better quality?—No; I know nothing of that.

5461. If there were some system of grading introduced, would it not be a very difficult matter; how could you analyse all the samples that were sent out?—I am afraid it would be a difficult matter.

5462. Would you fix the price on the morning milk, on the evening milk, or on the mid-day milk?—I have an idea that a man ought to sell always milk of a fair quality. If his morning's milk is poor, then he should take some means of making it better; but if it is to be sold, as we are speaking, by grading it, then you just require to lay down prices for milk of a certain quality.

5463. How would that quality be ascertained, and the price fixed according to it?—I say that is my idea—what I would like to see, but I think there is a certain amount of difficulty in the way.

5464. You mentioned the practice of taking the evening milk, partly removing the cream, and mixing it with the morning milk?—Yes.

5465. That, I take it, is only done on the farms?—By the wholesale people, yes.

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5466. That is not the case in the milkshops in the town?—I do not know; I rather think it is.

5467. I was rather led to believe, from what you said, that the milk goes straight away into consumption from the cowsheds?—In the morning.

5468. But not the evening milk?—Not the whole of the evening milk.

5469. Then, though there may be three milkings from cowsheds in the town, there are only two deliveries?—I think far the larger quantity of milk is just sent out in two deliveries. I know in the case of the milk supplied to my own house there are three deliveries, but I do not think that is common. However, I cannot speak with perfect certainty on that; that is a matter of hearsay.

5470. May I ask what the last delivery daily is—what time?—I think it comes to my house somewhere about four or five o'clock.

5471. That is not the evening milking, is it?—No, that is not the evening milking. That would be the afternoon milking, I suppose.

5472. So this practice of partly removing the cream and mixing the evening's milk and the morning's milk will go on in the cowsheds as well as on the farms?—I believe it does.

5473. The fixing of a standard would not stop that, would it?—I think it would, unless you made the standard too low.

5474. That was what I wished to put to you; in order to cope with that you must have the standard pretty high?—I think 3 per cent. would do it.

5475. An evening milking would probably be well above 3 per cent., more likely 4?—It depends on how you feed your cows. We get a large quantity of milk from this distillery or brewery stuff, but it is of a poorer quality.

5476. With milk produced under circumstances such as you have mentioned, with short intervals of milking, the tendency would be to get evening milk of high quality, would it not?—Certainly.

5477. And there would be a good deal of difference between that and the morning's milk?—Yes.

5478. So that, if you had a standard of 3 per cent. of fat only, it would give scope for the vendor to still remove part of the cream in the evening and mix the rest with the morning's milk?—It depends upon what the milk was, of course. If the morning's milk was only 2·5 it would make it still lower.

5479. To put it generally, the higher you put your standard the better you would be able to cope with adulteration of that kind?—Certainly.

5480. You would consider that to be adulteration?—Certainly.

5481. You have mentioned that, as the vendors go round, they sometimes carry special cans with them?—That is the case.

5482. But surely your sanitary inspectors, if they have any inkling that such a practice goes on, would not content themselves with taking just one sample, but would take a sample out of more than one can, would they not?—Those are the only two cases which have come to my knowledge lately.

5483. A case that has been actually proved?—Yes.

5484. Do you believe that it goes on more frequently?—More frequently than that, I should think, but I do not know that it is very common.

5485. Are there many separators used in the neighbourhood of Edinburgh?—I think there are.

5486. You think there are?—I think so; there is a large demand evidently for cream, and they can sell the skimmed milk very largely to those great biscuit manufacturers.

5487. When you speak of skimmed milk as being used by the biscuit manufacturers, do you mean hand-skimmed milk or milk as passed through a separator?—I think it is separated milk—got by a separator.

5488. Do you yourself draw any distinction between these two, or think that any distinction ought to be drawn?—I think so. I think separated and skimmed milk should be sold as different things.

5489. On what ground?—What I mean by skimmed milk is milk skimmed by hand, and I do not think you can take off so much cream by hand skimming as you can by one of these modern separators; so that when you buy skimmed milk in that sense you would almost be sure of getting a little fat; I find in Edinburgh it runs from about 1 per cent. up to 1·5—in fact, I found one sample containing nearly 2 per cent. In separated milk I think the fat is practically nil.

5490. For what purposes would people buy skimmed milk under the belief that there was more fat in it, but who would not buy separated milk?—I suppose those people who buy it for their own use.

5491. The hand-skimmed milk will not keep as well?—No, I do not suppose it will, but I do not know. I should think separated milk would keep better.

5492. Does hand-skimmed milk come into much use as an article of consumption?—I only speak from results of the analyses that I make; I should think it does, because I cannot conceive anything like 1·0 and 1·5 per cent. of fat.

5493. What standard would you suggest for hand-skimmed milk?—I think 1·25 would be a very fair standard—from 1 to 1·25.

5494. Would you have any standard for separated milk?—I am afraid not for fat; I suppose separated milk contains practically no fat.

5495. It will be quite possible to mix a lot of water with separated milk, would it not?—I beg your pardon, I thought you spoke of the fat. I think it certainly should not have less than 8·5 of non-fatty solids.

5496. You would fix a standard as regards the solids?—Yes.

5497. Have you any views about cream; how is cream used in Edinburgh; are there different kinds of cream?—There is no recognition of different kinds of cream, but there are different kinds.

5498. Thick and thin, I suppose?—Yes, thick and thin. I think the standard that has been proposed—somewhere about 15 per cent.—is far too low. I think clearly it should have at least 40 per cent. of fat.

5499. For thick cream?—Yes.

5500. And for thin?—I do not know; I have never considered the question of thin cream.

5501. Is it important enough in Edinburgh to draw a distinction between the two?—I do not think so. I think if people buy cream they ought to get really as cream the fat of the milk without being purposely adulterated.

5502. Cream is a very relative term?—Of course it is, but I think, as I have said, that 40 per cent. would be a very fair proportion of fat.

5503. Do you mean you would not allow any cream to be sold unless it had 40 per cent. of fat? You might run a separator in a particular way and get cream of a very different quality to that?—You could have different qualities of cream, and, of course, you could sell it at different prices, but I think if one goes and asks for cream and pays a fair price, he is entitled to get far more than 15 per cent. of fat.

5504. You have not the same custom in Edinburgh that we had brought before us as the case in Glasgow—that even among the poorest classes cream is regularly used?—No, I have never heard of that in Edinburgh. I think Edinburgh and Glasgow are two very different towns in that respect—in many respects, indeed. I think in Edinburgh you will find a large number of very wealthy people in proportion to the poorer classes, so that those articles which might be called articles of luxury command a better sale and better prices.

5505. You are strongly of opinion that the trade demands, with regard to hours of milking, should not be allowed to be pleaded as indulgence in the case of prosecution?—Certainly not.

5506. Would it be possible for the milk vendors to alter their hours of milking?—I do not think they require to alter hours of milking. I think, from my experience in Edinburgh, that we should have no difficulty whatever in giving milk containing 3 per cent. of fat.

5507. If they fed their cows properly there would be no difficulty?—Not the least difficulty.

5508. But the continual feeding with very watery food has a stimulating action on the cows which tends to produce a low quality of milk?—That is the universal belief, I think.

5509. (*Mr. Cowan.*) Do you consider the milk supplied to Edinburgh is of such an inferior quality compared to that supplied to other large cities, such as Glasgow?—I have really not much experience of Glasgow milk. I believe that there is a large quantity of milk sent to Glasgow direct from the farms to the consumers under lock and key, and passing through fewer hands; I think possibly they have a better chance if got in that way of getting a better milk.

5510. Is it not generally understood that Edinburgh gets a poorer supply of milk than some of the larger cities?—You mean poorer in quality?

5511. Yes?—I suppose that is the opinion in consequence of this particular food that is used so largely.

5512. Is it not partly caused by the large number of dairies that there are in the town?—I do not know exactly why that should be.

5513. There are a larger number of dairies, are there not, in Edinburgh?—Do you mean a larger number of town dairies?

5514. Yes?—That is very likely the reason. Comparing the Edinburgh milk with some milk which I got from the country towns, as I have already said, it is on the whole poorer, but I do not think, in the case of the country towns, I have ever had grounds for conviction—I believe that there were perhaps one or two, but none to speak of—in any of these small towns in which I act as public analyst—Hawick, Galashiels, Alloa, Inverness, and so on.

5515. I think we may gather, from what you have said, that that is partly caused by the inferior feeding?—That seems to be a very general opinion—that it is due to the watery food the cows in Edinburgh get. It is also due, no doubt, to this practice of partially skimming the milk of the evening before.

5516. There is a certain quantity comes into the town from the surrounding farmers?—That is so.

5517. Do you know if there is any difference between the quality of milk coming in from the country and that found in the dairies?—As I have already said, this large supply association in Edinburgh, I think, get their milk principally, if not entirely, from the country, and the manager tells me they have not the least difficulty in getting the milk with 3·5 per cent. It is very rarely that I have milk like that in Edinburgh sold to the inspectors.

5518. If a fair standard was fixed you would be of opinion that it would improve the quality?—I think it would, because no doubt there are people just now in Edinburgh relying upon their cases being dismissed; they know perfectly well the opinion of the sheriffs on the point.

5519. It seems to be your opinion that there would be an improvement if milk was sold by quality?—I think that would be the proper way of selling it, if it could be done.

5520. Is it not your opinion that if a fair standard was fixed it would come to be sold pretty much in that way by quality?—It would be sold always up to the standard, or perhaps above the standard, but I think after you get up above that again you would never have it sold by quality. It would have no effect—I mean as regards the milk, which is of a distinctly higher standard.

5521. I think you said that in one of the Edinburgh dairies that sell milk they stipulate for a standard of 3·5?—That is so.

5522. In their case, if the standard rises above that or falls below it, do they not add to the price or substract from it?—Yes, I have already said that they do.

5523. Then that goes to show that it would be sold by quality to a certain extent?—That is a private bargain between those two people, and that is easily arranged.

5524. But that seems to be generally the case over the whole country with large creameries?—It may be, but I should think, dealing with the public, if you have a standard fixed that you will get your milk always up to or above that standard—if it is legally fixed; but I do not think it would regulate the quality of the milk after getting above the standard. I do not see how it could. People would take care then that their milk was up to the standard, but the majority would not care whether it was 1 per cent., or 2 per cent., or 3 per cent. above the standard.

5525. The man that feeds his cows above the standard would he not be entitled to an extra price for it?—I think he would; that is what I have been saying all along, but I do not see how he is to get it.

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5526. I rather gathered from what you said that you thought if a standard was fixed it would have a tendency to make the value of milk in that way by quality?—I say if we have a fair standard fixed in Edinburgh, then we can prevent people selling below that standard, but at present there is no standard fixed, and they sell any milk they like.

5527. Do you think there should be a uniformity of analysis arranged for?—If that could be done; if analysts would agree upon it I think it would be a very good thing to do. I always make my analysis in one way, unless I make corroborative tests.

5528. You have found some difference between the analyses of morning's and evening's milks?—I have, in what is said to be morning's and evening's milks.

5529. If the milkings were done at regular intervals would you expect to find much difference at twelve hours?—I suppose there would be very little difference. I believe it is perfectly well known among physiologists that the milk which is secreted first is the richest, but I have explained that some of the difference which I have found between morning's and evening's milk was accounted for by this practice of the Edinburgh dairy people mixing the partially skimmed evening milk with the morning supply.

5530. You would do away with that if there were regular intervals of milking, because then you would make no difference scarcely between the milkings?—I do not know what would prevent them from doing the same thing then as they do now. If you had regular milkings then I suppose the evening milk would be too late to be sold, for people do not want milk so late in the evening, so you would allow it to stand, and they might take the cream off it, and mix it with the morning's milk. That is how it fits in. It suits them in both ways.

5531. Is it your opinion that adulteration is principally caused by skimming the milk?—In Edinburgh that is so undoubtedly; in most other places the adulteration, especially in London, seems to be by water; but in Edinburgh it is more commonly by deficiency of fat.

5532. Have you ever found an addition of separated milk in any samples that have been before you?—It is very difficult to tell that; I have no doubt that the low fat content may be owing to the addition of separated milk, but you cannot tell whether the fat has been taken off or whether separated milk has been added; all we know is that there is a deficiency of cream.

5533. Would you not be inclined to fix a minimum for cream?—Yes.

5534. You have spoken of 40 per cent. for good cream, but could you suggest a minimum below which cream should not be sold as cream?—I think if you are to sell anything under the name of cream it certainly should not fall below 40 per cent. Of course, you might have a weaker liquid than that, and call it by some other name.

5535. But you think there ought to be a standard of 30 per cent. say as a minimum?—I would not have it lower than that.

5536. (*Mr. Barham.*) You say the prosecutions you have had of 2·1 and 2·7 of butter-fat have been dismissed?—Yes.

5537. And that has arisen not because in the opinion of the opposing analyst that milk was as it left the cow, but simply because he was unable to certify that it had been skimmed?—That is what he said in the witness box.

5538. Are you aware that in the last Adulteration Act you have the opportunity of referring milk of that description to Somerset House—where there is a dispute between the two analysts or between the prosecutor and the defendant?—That would be no good in this case, because all the Somerset House people do is they give you an analysis. Our analysis was not disputed; this gentleman's analysis was the same as mine.

5539. Have you ever referred a case to Somerset House?—No, I have never had a case in my experience referred to Somerset House.

5540. Have you ever seen a copy of the analysis they give you and the report they send down?—I think I have.

5541. And do you say they express no opinion on that report as to whether the milk is pure or impure?—What I say is, they give the analysis, but it would be no use in this case, because our analysis was not disputed; they were the same.

5542. Do not let us travel from where we started; you said Somerset House would give you the result of

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the analysis but would not express an opinion upon those results?—If I said that I am afraid I conveyed a wrong impression. I meant to say that Somerset House would not have helped us here, because there is no dispute upon this analysis. They might have added a note saying they were unable to affirm this has been adulterated, or something of that sort.

5543. If they added a note that this appears to be adulterated, or this, in their opinion, is adulterated, would that not have affected the decision of the Sheriff?—I think very likely it would.

5544. Although you have had these cases of miscarriage of justice, as you say, from time to time, you have never yet availed yourself of that section in the Act?—I do not think I said "miscarriage of justice"; I merely stated the fact.

5545. (*Chairman.*) I do not think it rests with the analyst to send this up to Somerset House; it is the magistrate; if I am not mistaken?—Yes.

5546. The magistrate sends it to Somerset House, and, as I understand the procedure, he sends it to Somerset House with a request that it will be freshly analysed; and unless the magistrate himself asks for an opinion from Somerset House they will not give it?—Yes.

5547. (*Mr. Barham.*) You are in court sometimes with your opponent, Dr. Drinkwater?—I am in court; if I suggested that to the Sheriff he would tell me to mind my own business.

5548. You have a lawyer, I presume, who manages these cases for you?—We have the Procurator Fiscal.

5549. Would it not be quite within his power to ask that the matter be referred sometimes?—He can ask it if he likes.

5550. It has never been done?—I do not think he ever did it—not that I know of.

5551. Then again, with regard to the Sanitary Inspector, who, I understand you to say, was directly responsible for these prosecutions, and with whom you discuss these matters in a friendly way, could it not be suggested to him that this should be referred to Somerset House?—Yes, I might have suggested that.

5552. Somerset House is an umpire that has been appointed by Parliament to decide these questions?—I quite admit that.

5553. To protect the trader or to decide between analysts, as the case may be?—The only man who has power to send to Somerset House is the Sheriff.

5554. Exactly so, but I have never known the magistrate to refuse when they have been asked by either one side or the other; I am not sure that they have even the power to refuse now. Have you or the prosecuting authorities in Edinburgh ever asked that this milk should be referred to Somerset House for their opinion as to its genuineness or otherwise?—I have never asked.

5555. Is it within your knowledge that the prosecuting authorities have ever asked?—I am not aware that they have ever done so.

5556. You speak of a large milk supply company in Edinburgh which adopts a standard of 3·5 of fat; does that mean the average for the day, or does it mean a minimum of fat for either meal? There is a return here from the Edinburgh Milk Supply Association apparently of the number of samples and averages of fats and non-fatty solids; the averages with the exception of two months are equal apparently with the standard that they bargained for?—Yes, I think that is so.

5557. But, you see, in two months the average is less than that—you know that, no doubt?—Yes, I think so.

5558. Have you a copy of their agreement with you?—No, I have not.

5559. You speak with confidence with regard to it; does it affect the average of the two meals, or does the minimum of 3·5 per cent. of butter-fat apply to each meal?—I understand that all the milk that is received is analysed, or the fat determined, at all events; and upon that they pay. A man delivers 500 gallons of milk, or whatever it may be, a sample of that is analysed, and he is paid for it according to the result of the analysis.

5560. You mean the producer is expected to send a milk at all times with 3·5 per cent. of butter-fat in it?—No, he does not quite send it at that. He may send anything he likes above 3 per cent. He is paid a little more and a little less. That is what they take as their—standard I suppose is the proper word to use. If the man's milk is a little more than that he is paid a halfpenny a gallon in addition; if it turns out anything lower than that, but still anything above 3, then a halfpenny a gallon is deducted; if it turns out anything lower than 3 then the milk is returned—they will not have it.

5561. What I want you to tell me is whether that 3 per cent. is ascertained for the day or whether it is ascertained for each meal?—I have already said that I understand that as the milk is delivered it is analysed.

5562. Each meal then?—Whenever the milk comes.

5563. If it is 3·5 of fat for the morning milk, that would lead us to believe that the evening's milk would be say 4·5 or 4·2 or 4·3; you recognise that there is a difference between the quality of milk in the two meals, I presume?—You mean to say that if the morning's milk analysed 3·5, the evening's milk would very likely be richer?

5564. Exactly?—I suppose it would.

5565. So you would lead us to suppose that the average for the day would necessarily be nearly 4 per cent. of butter-fat?—Not necessarily; it depends how much richer the evening's milk was.

5566. If the variation between the morning's and evening's milk was equal to 1 per cent. of butter-fat?—Yes, of course it depends on that.

5567. (*Dr. Voelcker.*) Where does this milk come from—I mean the mixed evening's and morning's milk?—I do not think that practice is carried out here; there is too sharp a watch.

5568. I say the mixing—not the skimming?—I beg your pardon. I am totally ignorant as to how these people get their milk. My information is derived from the manager, and he did not tell me how he gets the milk or when he gets it, but I understand that all the milk is analysed, and the price determined accordingly.

5569. (*Mr. Barham.*) Anyhow, the milk is of a high quality, as we might suppose it would be where a premium is paid for an extra proportion of butter-fat and when a fine is inflicted when the butter-fat is deficient?—It is over 3 per cent. I do not know that that is a very high quality; but it is a good milk.

5570. 4·09 is the average for May, one of the poorest months in the year; do you not think that is a high quality milk?—Certainly.

5571. 3·93 for the month of January; is that not a high quality too?—It is very good milk.

5572. 3·97 for the month of April, another of the poorest months of the year, is that not a very high quality?—Yes, I should think anything over 3·5 was.

5573. With two exceptions, they are all over 3·5, I think, so they must be of a high quality necessarily?—Yes, no doubt.

5574. In paragraph 7 of your proof you say the standard "might possibly be somewhat raised." Now, if your present standard, apparently upon which you cannot get a conviction is 2·1 or 2·7, would not a fixed standard of 3 per cent. be raising it very considerably?—My standard is 3 per cent. now.

5575. But upon that you cannot get convictions apparently, and I take it that if this Committee recommended a standard of 3 per cent. and the Board of Agriculture adopted it, that would be a fixed standard which everybody must comply with?—Quite.

5576. That would be a considerable raising of your present standard or the standard, at all events, upon which convictions take place?—There is no standard upon which convictions take place in Edinburgh.

5577. What I want to point out is that if the Board of Agriculture fix a standard of 3 per cent., then they may practically be raising considerably the number of convictions that are taking place at the present time?—Anything will raise the number of convictions, because there are no convictions taking place at all.

5578. Exactly, that is what I say?—It will be raising the standard to a considerable extent. If we get only one conviction it will be raising the number.

5579. Then you say, "This would not be altogether unfavourable to milk sellers"—I am not going to assume it will be—"as there can be little question that if milk were of better quality more of it would be sold, especially in a town like Edinburgh"?—Yes.

5580. I think that is a conclusion that we all would arrive at, but what I should like to know is, when there is a supply of milk in Edinburgh giving nearly 4 per cent. of butter fat, which you tell us can be obtained at the same price as milk which gives little more than 2 per cent. of butter fat, why is there not a tremendous demand

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or why do not their sales increase at a very rapid rate?—I do not think I said the milk was sold at the same price.

5581. Anyhow, we will go back again; you say if milk were sold of a better quality in Edinburgh than what you describe there will be a very large sale for it?—I do not think I said that; I think I said there would be more sold.

5582. "More sold," is that not the same?—You said a very large sale. I am judging by myself. If I thought I was getting very good milk I would be inclined to buy more of it than I do at present.

5583. It depends partly whether you have to pay a higher price for it?—Well, one would pay a higher price for it if one got much better milk.

5584. Are there many cows kept in Edinburgh?—I believe there are a very large number.

5585. I understand 7,000 is the cow population of Edinburgh?—I am afraid I could hardly go into figures, but I have always understood there is a very large number of cows kept in Edinburgh.

5586. It is so, I believe. They are fed, you say, partly on brewers' grains?—Yes, I believe they are.

5587. And they produce, as a rule, very poor milk?—That is the general belief.

5588. Of course, we know that distillers' wash and refuse of that kind would force the cows very rapidly, and produce very poor milk indeed?—Yes.

5589. You think it would be an advantage if the milk supply of Edinburgh could be brought in from the country and the cows kept in Edinburgh dispensed with?—I do not know that I am competent to express an opinion on that point, but for myself I would rather that I got my milk from the country.

5590. I think you say that poor milk can be produced by feeding the cows badly; supposing that milk is produced in the cow in that way, I presume it would not be up to the standard of 3 per cent. in a general way?—It depends on what other food they get. I suppose it would be possible to supplement this brewers' food with dry food, which would bring the milk up.

5591. Only you speak of this milk being so poor that you would not allow it to be sold?—I would not allow milk to be sold under 3 per cent. of fat as sweet milk.

5592. You have, I think, told us that there is a good deal of milk sold with less than 3 per cent. of fat?—That is so.

5593. Can you tell me where the margin is for skimming that milk?—I do not quite understand.

5594. Supposing the milk is so poor through the cows being fed on brewers' grains and on distillers' wash and brewery and distillery refuse, can you tell me how it could be skimmed, as you suggest?—In the ordinary fashion, I suppose.

5595. But where is the margin between the butter fat produced and the butter fat that has to be sold?—Do you mean how much fat they could take off it?

5596. Yes, where is the margin to be taken off without discovery?—If it contains 2 per cent. of fat they might have taken off half.

5597. Then you think there would not be a conviction in Edinburgh?—I have told you already that we had a case where there was only 2 per cent. of fat, and there was no conviction.

5598. It seems strange that you should suggest that when you also tell us that the dairymen are selling skimmed milk with 2 per cent. of butter fat in it?—I do not think I said that. I spoke of one case I had had of skimmed milk with 2 per cent. as being a very peculiar case.

5599. I think you said 1 to 2 per cent., and you suggested 1 to 1·5 per cent. as the minimum for butter fat in hand-skimmed milk?—I suggested that the standard for butter fat in hand-skimmed milk should be from 1 to 1·25 per cent.; and I said, in answer to Dr. Voelcker, that the quality of skimmed milk varied—that I had got one case, but only one case, where it was about 2 per cent. I did not mean to say from that at all that that was common with skimmed milk.

5600. I thought you meant to say that skimmed milk usually contained, in your experience in Edinburgh, from 1 to 2 per cent. of butter fat?—No, I merely gave that as an instance to show that the fat in skimmed milk varied by the ordinary process of skimming. I think that is the only case I can ever remember when I got anything like that with skimmed milk; and it was quite exceptional.

5601. Now, in regard to your own standard; you suggest that the standard in future should be 8·50 and 3·25?—I said 3, but it might be over 3 quite well; I should think 3·25 would not be too high.

5602. Which of those two standards do you suggest? I think you say in your proof 3 per cent., but I am not quite sure?—Yes.

5603. In answer to Professor Thorpe I think you said 3·25?—3 per cent. is what I have taken for the past twenty years, and I think it is a very fair milk if you get 3 per cent. in it, but I think it would be no hardship to make it 3·25.

5604. If a standard were recommended by this Committee would you suggest that it should be 3 per cent.?—3 per cent. would satisfy me.

5605. And 8·50?—Yes.

5606. Would you not prefer that there should be a standard of total solids of 11·50, containing not less than 3 per cent. of butter fat?—That is the same thing put in a different way.

5607. Exactly, but it makes a little difference. You may get, as Sir Charles Cameron, who was here the other day said, 3·5 per cent. of butter fat in a milk with 8 per cent. of non-fatty solids, and that should be of greater value than a milk with 3 per cent. of butter fat and 8·50 of other solids?—Yes.

(*Professor Thorpe.*) Sir Charles Cameron gave that evidence upon the assumption of there being 12 per cent. of total solids.

5608. (*Mr. Barham.*) Does what Professor Thorpe has said affect your reply?—No. I think 3 per cent. of fat is a very fair standard, and I would be quite satisfied with it.

5609. You think 11·50 of total solids with a butter fat of not less than 3 per cent. would meet the case?—I think so.

5610. I merely make that suggestion to you because you have said during your evidence that the milk sometimes is below 8·50?—By reason of the fat being high?

5611. Exactly?—Quite so.

5612. In those cases you would not recommend a prosecution or certify that the milk had been adulterated?—No, I think not, if you have 11·50 total solids.

5613. There is one thing in your proof which I think you did not mean, and I want to give you an opportunity of putting it straight if you should desire to do so. You say: "Milk from single, diseased, or badly-fed cows may fall below this standard, but such milk has no more right to be sold than diseased milk or rotten fruit." Do you mean that?—I mean to say that you should not be allowed to sell milk of that kind; you are not allowed to sell rotten fruit, and I think you should not be allowed to sell milk of that kind either as sweet milk.

5614. Do you really mean what is stated here?—I do not mean to say that the offence is the same, but I mean to say if you prevent a man from selling diseased meat or rotten fruit, so you should prevent him from selling such milk as sweet milk.

5615. I will not carry the argument very far, but this is what I was leading up to: You mean that you would not allow the milk of any one single cow to be sold by itself unless it was mixed with the milk of other cows; if that means anything, that is what it means?—If the milk came up to the standard?

5616. If it did not come up to the standard; here it means either way, but we will take it that it did not come up to the standard?—It does not matter whether it comes from one cow or a thousand cows; if it is below the standard.

5617. We will take it on that by supposing it is below the standard of 3 per cent. of butter-fat; you would not allow that milk to be sold, and you would place it in the same position as diseased meat and rotten fruit?—No, I did not mean that.

5618. You cannot possibly mean it. However, what I wanted to get at from you was whether you meant it or not?—I meant it is in a condition in which it should not be sold. Possibly it would have been better to have left that out.

5619. "Badly-fed cows"; who is to be the judge of a badly-fed cow or of a good one?—I do not think it re-

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quires a judge; I mean to say milk should not be sold below the standard.

5620. Exactly; then "badly-fed cows" comes out?—I merely say that it should be no defence for a man to say that his cows are badly fed. We have it sometimes stated in those cases in Edinburgh by the agent for the defence that this cow has been perhaps in weak or bad health, and has not fed properly, and therefore it produces poor milk, and therefore the man has not adulterated the milk, but has simply sold the produce of a cow which has been fed in this way. I do not think that should be a defence.

5621. You go on to say, if the milk is rendered below—I suppose that is what has to be read into it now—below the 3 per cent. standard you would not allow him to plead that it was because a longer interval had elapsed between the milkings?—No, I do not think a man should be allowed to put forward as a defence any excuse for selling milk of that sort. It is his business to find out what the quality of the milk is that he is selling.

5622. So he must either feed up his cows or buy such a breed of cows as will produce that quality?—Certainly.

5623. Or he must shift the time of milking?—He must do something. He must supply us with milk of that standard. If you allow him to plead that excuse, then you open the door to all sorts of excuses.

5624. I was a little puzzled at first—I am a little clearer now, and it might be better to put it on the minutes perhaps—by your reference to morning milk and forenoon milk. What do you mean by that?—The morning milk is milk, I understand, which is milked about five o'clock in the morning; then I think the next milking takes place some time about eleven or twelve—that is what I should call the forenoon milk.

5625. (*Professor Thorpe.*) That you mean in reference to Edinburgh?—Yes, I am speaking of Edinburgh.

5626. (*Chairman.*) May I ask you to look at Paragraph 10 in your proof? You say there: "If the fat in the milk sold to them falls to 3·25 they deduct a halfpenny per gallon, and if it falls below 3 per cent. they will not have it at all. They assure me, however, that they have no difficulty in obtaining milk of a suitable quality at 1s. 2d. per gallon"?—That is a mistake; it is from 9d. to 10d.—that is what they sell it at. The manager was dictating to me, and I took down a wrong figure.

5627. I think that you would like to state that you know milk is sold in another town at 10½d. or 1s. a gallon; does that come within your knowledge?—Yes, that is in Hawick.

5628. As regards these town dairies in Edinburgh which give, you say, poor milk in consequence of the manner in which their cows are fed; have you any analyses of these milks specially confined to those dairies?—No; I have not.

5629. Can you say of your own knowledge what the average quality of these milks would be?—It varies, I believe, according to the other food the cows get—they are not fed entirely upon those grains.

5630. Do you think there would be difficulty in coming up to 3 per cent.?—I do not think so.

5631. Therefore, if a standard of 3 per cent. were fixed it would not endanger the position of the owners of these town dairies?—Not the very least, because they might use a little less of this distillery refuse and a little more of the concentrated food.

5632. Still, if their milk came below 3 per cent.—say 2 75—they would not be able under the Act to prove clearly to the satisfaction of the authorities that the milk was genuine milk?—Yes, they can so feed their cows as to bring it down to that.

5633. They can?—Yes, they can.

5634. They would be safeguarded by being able to appeal to the cow?—I do not think they should.

5635. You do not think they should, but at the same time the Legislature contemplates that anybody who does not produce milk up to the standard that has been laid down has nothing to do but to prove that the milk is really genuine, and that it came from the cow?—Of course, they could do that easily, because they could go on feeding with this diluted food until they came down to it.

5636. At the same time, this standard, whatever it may be, would not prevent them continuing their system of feeding their cows on this poor stuff?—I do not think so.

5637. Can you tell me if the inspection which is carried out under the authorities in Edinburgh is unpopular?—Do you mean the inspection of the condition of the cows?

5638. No. Is the fact that the inspector is taking samples an obnoxious fact to the population?—With a number of them it is; with the better class of milk people, I think they rather welcome it.

5639. Generally speaking, is the sympathy with the adulterator?—I think so—that is, among the adulterators themselves. I do not think the general population have any sympathy with them.

5640. I said the general population?—I beg your pardon, I do not think they have.

5641. You do not?—None at all.

5642. We have had it in evidence that in another place the general feeling is in favour of the adulterator?—That is not the case in Edinburgh—not at all. I have been spoken to again and again by people appealing to me, so to speak, upon the unfortunate state of this Act of Parliament, and the conditions under which we are working.

5643. Do you know anything about the quality of the milk that is sold by the Cash Milk Supply Company?—No, I do not know personally; I believe it is fairly good milk though.

5644. Will you kindly tell us if you have any observations to offer to us with regard to a standard for condensed milk?—My experience has not been great in condensed milk. The condensed milks I have had I think have been fairly good, but my experience is very limited. I do not think there is much used in Edinburgh.

5645. Have you any opinion of your own as to what standard should be laid down?—I am afraid at the present moment I could not even suggest a standard for condensed milk; I am not at all familiar with it.

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Mr. William H. Ralston, called; and Examined.

5646. (*Chairman.*) You are come before us to-day, I understand, as the representative of the Wigtownshire Dairy Association and the Wigtownshire Dairy Farmers' Association?—Yes.

5647. Can you give me any idea of the number of the two associations together?—I can give you pretty nearly the number of cows represented.

5648. Give us that?—Something like 6,000 in each association.

5649. Twelve thousand cows altogether?—Yes.

5650. I believe your associations have met and considered this question?—Yes.

5651. Have they come to any resolution on the subject?—Yes, they have.

5652. What resolution have they come to?—They came to the resolution that milk should be considered to be adulterated if it was below 3 per cent. of butter-fat and 8·5 of solids other than fat.

5653. Then I may take it that if such a standard were laid down by the Board of Agriculture it would meet with the approval of all the dairy farmers in your district?—Yes, it would.

5654. You say that in Wigtownshire there are a certain number of creameries starting?—Yes.

5655. They buy their milk from the farmers on the quality of the milk?—Yes, they do.

5656. And they vary the standard according to the seasons of the year?—Yes.

5657. But in no case is the standard fixed below 3 per cent.?—That is so; the lowest at any time is 3·4.

5658. And they have no difficulty in producing the quality of milk?—The average reaches pretty near that quality at all seasons of the year.

5659. What class of cattle is there mostly in this county?—Entirely Ayrshires.

5660. And your experience of the Ayrshire cows is that they give a very good quality of milk?—They give a very fair quality; they give it up to 3·4 quite easily.

5661. You give us some figures in your proof which perhaps you would kindly go through (*See Appendix*

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XIII)?—These figures were supplied to me by the managers of the United Creameries, Ltd. They have three creameries under their control, but those figures refer only to the Dunragit Creamery; that is a creamery which is within a few hundred yards of where I live myself. These are the actual figures for the whole milk that has been supplied to the creamery during the period from 1892 to February of the present year. The average you will notice is worked out for each month separately and for each year separately. At first when they started the averages were rather lower than they have come to be later on. That probably arises from the fact that people got accustomed to working up to the standard better than they did at first; in fact, that was the cause, I think, at first for the creameries to adopt a standard at all. They felt that they were not getting the milk as it came from the cow, and they adopted this method of testing or checking the quality of the milk in order to get the milk as it came from the cow.

5662. The standard has been gradually raised from the first after the immediate beginning of this checking?—Yes. These figures represent cows that were tested last year during the summer just for the satisfaction of the owners of the cows. Every cow was taken, and the milk was taken and sent in to the creamery to be analysed. That was analysed at one of those creameries under Mr. McCracken's supervision.

5663. Was each cow taken separately?—Yes.

5664. I see when you go to the lowest you run down to as low as 1·70?—Yes.

5665. Is there any explanation why those particular five cows should be so remarkably low?—There is no explanation that I know of—none whatever.

5666. Being in large herds their milk was blended with the others, and the general average was kept up?—Yes. You will notice that even the general average of those cows that have been analysed comes up to a fair standard —all above 3 per cent. except in one case where there were eight selected cows. These cows, I believe, were doubtful as to the quality of the milk, and were selected to see what their quality was, and it was found to be rather under 3 per cent. when it was mixed altogether.

5667. On what principle were those cows selected?—They were selected, I believe, because it was thought by the owners of the cows that they were not giving a high quality of milk. That is the impression I have.

5668. That is how they selected the eight worst?—That was the idea, I think.

5669. In one particular herd?—Yes, these were all taken from one herd.

5670. How many would there be in the one herd?—About eighty cows.

5671. This is one-tenth?—Yes.

5672. One-tenth fell below the average of 3 per cent.?—Yes.

5673. Then you give the figures showing the result of the tests taken on milk produced by different kinds of food?—Yes, that was carried out for my own satisfaction and for the satisfaction of some of my neighbours. That was immediately after the creameries began in 1892 to buy the milk as tested. This was early in 1893. I purchased a Babcock tester myself for my own satisfaction and for the satisfaction of some of my neighbours, and I was in the habit of analysing their milk by this test. If they were dissatisfied with the test at the creamery they brought it to me to counter test. At that time we were under the impression that we could alter the quality of the milk by the food that we gave the cows, and I began this experiment for my own satisfaction to see if that were possible to any great degree. I found, after working at it for a considerable time, that I could change the butter-fat very little—almost imperceptibly. I thought it was our duty as dairy farmers to feed for quantity of milk more than quality—the quality would look after itself pretty well if they were fairly fed.

5674. Of course, in a large herd like that of 100 cows a certain number of them would fall below the average?—Yes, quite a number.

5675. But taking the whole 100 cows through the average works out to 3·57?—Yes, for that particular time it works out to 3·57.

5676. You would say from that, I suppose, that any large herd ought to give an average of at least over 3?—Yes, quite.

5677. We would be quite safe in fixing a standard at that point?—That is my opinion.

5678. You submit also tests of milk from 100 cows for part of the season of 1894?—Yes, that was taken at a creamery that I was sending milk to at that particular time.

5679. What did those tests show?—The lowest test there I see is 3·2 in April and May; none of the other tests fall below 3·4.

5680. (*Professor Thorpe.*) They go up as high as 3·8 in October and 4·0 in November?—Yes, that is the case; it is quite usual to find the milk in Wigtownshire rising to about that at that season of the year, as the cows nearly all calve during the late winter and early spring months, and that is the latest period of lactation.

5681. (*Chairman.*) Then you have a schedule showing the butter-fat of 72 cows under your control?—Yes.

5682. They were tested in 1897, 1898, and 1899, and gave averages of 3·8, 3·73, and 3·81?—Yes, these are the high months; we were making cheese during the other parts of the year. We supply milk to the creamery during those five months and during the other months, during the summer, we make Cheddar cheese. That happens to be the test at the creamery, and I am paid for the milk on that basis.

5683. These are the times of the year at which you are not making cheese?—Yes.

5684. In making cheese is it your object to produce as much milk as possible, or have you regard to quality?—We require to have regard to quality as well. The more solids you have the more cheese you will have per gallon of milk.

5685. You want to get as much milk as you can at a particular season of the year; when your cows are drying off do you find that they improve in quality of milk?—Yes, most decidedly they do.

5686. You say that from all you know of Ayrshire cows and from your own observations you conclude that 3 per cent. of butter-fat as a minimum would not unduly press upon any producer?—That is my opinion.

5687. You also think that if consumers could be sure of getting as much as 3·40 there would be a much larger demand for milk?—I am quite sure there would.

5688. The solids other than fat you consider should be 8·5 as the minimum?—Yes, generally speaking. I have not so much experience of the solids other than fat; it is mostly in regard to the fat that we are selling on. The solids not fat, of course, we require in cheese making, and I can show you from a dairy book that on the average of several years the solids other than fat and the fat rise as the period of lactation increases—that the percentage of curd got from the milk is greater at the end of the year than at the beginning, for instance. In September it will reach probably nearly between 6 and 7 per cent. more of curd to the milk, and in April it will have just about as much less. There will be nearly 13 per cent. difference between the curd produced by the milk in April and in September. That is my experience over a series of years.

5689. Then you say that though a great quantity of this milk goes into consumption in large towns you have never had any complaints as to its quality?—Never.

5690. Although it is sent in unlocked and unsealed cans?—Yes, unlocked and unsealed.

5691. Do you send your milk with the Glasgow and South-Western Railway?—No, never. All my milk, when I did send it to any of the towns, always went south. It went to Liverpool, London—and Sudbury I have sent to.

5692. What was the railway?—Partly Glasgow and South-Western, partly Caledonian, and you get on to the English lines at Carlisle.

5693. Is there any objection on the part of the railway companies to your locking or sealing the cans?—At that time they objected to our locking or sealing them. They wanted to be able to see without any trouble that we had the actual quantity there.

5694. Is it the practice still to send it in unsealed cans?—Yes, it is sent unlocked.

5695. You do not ask to have it done because you do not find it necessary?—No, I do not think so. I never had any complaint. I lost milk at first when I sent it to Liverpool—that would probably be early in the eighties. I was losing several gallons of milk each day. I put myself in communication with the railway companies, and we arrived at the conclusion that it would be better to invoice the milk by weight than by numbers of gallons; so each can was weighed and invoiced at the

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station by weight. It seemed to be known to whoever was taking the milk that this was being done, because I never lost a pound of milk after that.

5696. Was the tare of the cans marked?—Yes, everything; the full weight of the can with the milk.

5697. There is no difficulty at all now you consider in sending milk from your district by the railway?—None whatever; such a great quantity goes that a few gallons would never be missed, I think.

5698. (*Professor Thorpe.*) You also think there is no practical difficulty in the way of weighing the milk? You weigh the milk?—Yes, I weigh it myself, and it was weighed at the station. Of course, they did not take my weight, but I weighed it at home to check the station weight.

5699. Has there been no practical difficulty in carrying out the system?—No, it was only weighed for a very short time; I did not require to continue that practice.

5700. (*Chairman.*) You say great quantities of separated milk are sent to those towns in the winter and early spring months?—Yes, very large quantities.

5701. Does that fact interfere at all with the price you get for your milk?—It may indirectly, but I do not think it does directly. It will affect us in another way, because if the creameries can get a good price for their separated milk they can afford to give a little more for their new milk as they are getting it from the farms—and they are getting practically a great quantity—all during the winter and spring months; the bigger the price they get for the separated milk the bigger the price they are able to give for the whole milk; and of course if separated milk goes for adulteration purposes it is worth more than to sell as separated milk.

5701.* Have you any idea in your own mind as to what the present standard is?—For separated milk?

5702. No, for milk?—I understand that the Somerset House standard has been used in Scotland pretty largely—2·75 of butter fat.

5703. That is the prevailing impression in Scotland?—Yes.

5704. We have it, I understand, that the Somerset House standard is 3 per cent.?—So I have heard lately.

5705. It does not seem to be generally known. You say in your proof you cannot tell us much about cream?—I have had a little experience with cream. I have had to do with the management of a creamery for a short time, and I had to see to the taking of it off, and have sold cream in that way.

5706. What is your idea of a standard for cream; do you think there ought to be one?—I am not very sure as to that; it would be most difficult to fix. However, at the present moment our creameries have a large trade in a sort of potted cream. They put it up in little pots, and it is sold at 6d. a pot. That cream requires to be taken off very thick; I should say it would show probably 50 per cent. of fat. When they are taking it off just for making their butter, which is of a poorer quality altogether—probably 15 or 20 per cent.—they find it easier to manipulate in the churns.

5707. Do you think the consumer ought to expect a certain amount of fat in cream when he buys it?—Certainly; when he is buying cream he should get it.

5708. What do you think would be a reasonable limit?—I do not know; I fancy a sort of medium between the two—about 30 per cent. probably might be the lowest.

5709. (*Mr. Cowan.*) Would you not suggest a minimum?—I do not think you should suggest a lower minimum than something like that. If a man is buying cream he expects to get it.

5710. (*Chairman.*) We are told that people generally in Glasgow buy what they call cream, which satisfies them perfectly, but it only contains 15 per cent., and they pay a price accordingly. If the standard were raised to 30 per cent. and nobody was allowed to sell cream under 30 per cent., apparently it would dislocate a very large industry in Glasgow?—I am afraid some of the Glasgow people's opinion of cream would be a very hazy sort of thing.

5711. I have no doubt they regulate their price according to the commodity they get?—Probably they do.

5712. You say you think all analysts should adopt a uniform process?—I think so; it would be fair to the milk producers.

5713. You would not tie the analyst down to one special test when there are so many well known ones?—No. I would have it generally to be pretty much on the sam process.

5714. (*Professor Thorpe.*) You say in your proof that your association, or your two associations—because I suppose they came to a joint resolution on these matters——?—Yes, it was a joint resolution.

5715. After a full expression of opinion agreed upon a minimum of 3 per cent. of butter-fat with 8·5 per cent. of solids other than fat "as the very lowest that could be adopted in the interests of both the producers and consumers." Those terms "as the very lowest" rather seem to imply that they would not be altogether adverse to the adoption of something in the matter of fat rather higher than 3?—That is so.

5716. Are you prepared to tell us what you think they would be inclined to take?—I think 3·25 would be a fair thing in butter fat; that is my own personal opinion, and I know it is the opinion of others than myself; but that was not come to as a conclusion you know.

5717. You, I gather, use the Babcock milk tester?—Yes, I have been in the habit of using it for some years.

5718. Is the use of that tester pretty general among large farmers or large milk producers?—There are a few of them now using it. At the time I began to use it there was nobody using it except myself, so far as I am aware, as a producer. It is used entirely in the creameries. The creameries try their milk at this particular standard, 3·4 or 3·6, and the test is the Babcock test, as used in their creameries—as they use it themselves.

5719. There is a good deal of milk then bought and sold on the indications of this tester?—Thousands of gallons a day.

5720. Where do you get the tester from?—I got it from a local man in Stranraer. The machine itself is not difficult to make. The man who supplies all our dairy utensils, Mr. Gray, supplied mine. The bottles require to be specially made. I do not know where he got them from, but I got them tested at the creamery.

5721. How did you test them?—I tested one against the other. That is the only means so far as I know that they have of testing. They keep bottles that have been absolutely tested, and if they get a new supply of bottles they test them against these with the same sample of milk, and do not use them if they find the slightest variation.

5722. Do you think it would be welcomed by you and by persons like yourself who check the produce of your cows if some authority should certify as to the correctness of these bottles?—I think so: it would be a great advantage certainly.

5723. If some central authority could certify for a comparatively low fee as to the accuracy of the graduations on the bottles it would be, you think, a welcome thing?—It would be a very welcome and very valuable thing indeed.

5724. Are you of opinion that in the larger towns a considerable quantity of separated milk is mixed with fresh milk?—I know that it is the practice in Glasgow. Speaking of producers, men who are supplying Glasgow from the neighbourhood, and even from our neighbourhood, it used to be the case that the evening's milk was set in pans and the producer was asked to skim the cream off in the morning, and to put it into a separate vat. The separated milk is sent in a separated vat too. The morning's milk is sent new. The morning's milk and the evening's milk, I understand, are sold together as new milk, and the other is sold as cream. I have been told that is the practice. I do not know it myself, but I have been told by a man, who seemed to know, that that was the fact.

5725. If the limit of butter fat ought to be regulated, and the morning milk was generally poor in fat, are you of opinion that the evening milk would have either a considerable portion of its fat abstracted or a considerable amount of separated milk added to it?—Yes, but it is not my experience that there is any difference between the evening and the morning milk.

5726. If you milk your cows at fairly equal intervals of time?—At regular intervals of 12 hours.

5727. Are you aware if there is any great disparity if the cows are milked at unequal intervals?—Yes. I fancy there would be then; that is my opinion.

5728. So that if there is a wide difference between the evening and morning milk, and if the standard had reference solely to the conditions as indicated by morning milk there would be great probability that the evening supply would be diluted with separated milk?—It is quite possible, I think.

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5729. (*Major Craigie.*) You are representing the county of Wigtownshire, I see?—Yes.

5730. Have you any experience of dairy matters in other counties of Scotland?—No, I have not.

5731. Not further north?—No.

5732. Nor in the east?—No.

5733. Therefore your evidence relates entirely to that particular district?—Entirely to Wigtownshire.

5734. In answer to Professor Thorpe just now you spoke of the regular hours of milking; have you in Wigtownshire much difficulty on the question of labour in getting men or women to milk?—It has begun to be felt more now. We have not had the same difficulty that I know they have had in other districts in Scotland up till now, but now it is beginning to be felt.

5735. Within the last six months or so?—Within the last few years it has been getting gradually more difficult.

5736. Does that difficulty extend to women as well as men?—The milking is all done by women—entirely by women.

5737. Are the class of milkers that you have now inferior to what they used to be 8 or 10 years ago?—They are not improving at all.

5738. (*Chairman.*) How many cows will a woman milk in an hour?—They are supposed to milk 10 cows in an hour, but it takes about an hour and a quarter. That is their work, 10 cows in the morning and in the evening, and they are supposed to do that in an hour, but it takes, mostly, as I say, an hour and a quarter or an hour and 20 minutes.

5739. Is there any extension of the use of the mechanical system in your neighbourhood?—It has been tried, but it has not been continued.

5740. (*Major Craigie.*) Referring now to the two associations you represent here to-day, what is the distinction in their character? One, I see, is named the Dairy Association, the other the Dairy Farmers' Association; may the Committee take it that one is an association of producers and the other of distributors?—They are both producers, but the Dairy Association is mostly composed of cheese makers, pure and simple; the Dairy Farmers again consist mostly of milk sellers.

5741. In the same district?—In the same district; very probably there may be a few members of both associations, but that is the sort of practical dividing line between the two—that the members of the one association make cheese and the members of the other association sell milk.

5742. With reference to the use of the Babcock milk tester to which you referred, in answer to Professor Thorpe, are there any other tests of the same nature, the Gerber, for instance, in use?—No, it has been entirely the Babcock that has been in use.

5743. How long has that been in use, since 1892?—Yes.

5744. So that all the figures in your Head, No. 4, were ascertained by the Babcock tester?—Entirely with the Babcock.

5745. May I take it that you put in that table as it stands to appear in the Appendix?—Yes, it is for use.

5746. Have you yourself had any difficulty with the Babcock bottles that have been referred to just now; have you had any inaccurate cases?—I always get mine tested before I begin to use them myself. My tester did eight bottles at a time, and it is not so difficult to get eight bottles right, as a bigger one requiring perhaps 20 or 30 bottles.

5747. You have had cases where the bottles were inaccurate, and had to be rejected, have you not?—I did not use them. When I got a new supply of bottles, and found they did not correspond with the old I discarded them—I broke them, because they are no use. They are misleading I consider.

5748. I think, in answer to the chairman, you stated that if consumers could depend upon getting milk of a high grade at least with 3·4 per cent. of butter fat the demand would be much greater than it is; on what do you found that presumption?—I found it on the presumption that when a man gets a good article at a fair price he is inclined to use more of it than if he gets a very poor article, and has to pay the same price for it. It is a sort of natural thing that he buys more if he gets a good thing.

5749. You believe the public would be prepared to pay a better price for a better article?—I think so.

5750. Do you think in the district served by the producers in Wigtownshire there is a greater demand for milk for consumption than there used to be, or less?—Greater; the demand for milk is increasing.

5751. I speak now of milk not of butter or of cheese—is the demand for milk increasing?—Yes, it is increasing very much within my recollection.

5752. Is there in the district a development of production as well?—Within my recollection the district is not improved much in the production, because it was producing nearly as much as it could since ever I remember; it has always been a dairy district.

5753. It is not producing more per cow than you were producing ten years ago?—No, I do not think so.

5754. On that point of the demand of the public for better milk have you considered the proposal that one or two witnesses have dealt with before us of having milk sold not at one price but by the grade of two qualities of fine milk, and second milk, say?—Yes. If it were possible I think it would be a good thing, but I think it would be almost unworkable; I do not see how it would work with small retailers; I do not see how you could get them to guarantee the quality of their milk. I have no doubt if the public could get it that way they would prefer to buy it.

5755. But you do not know a case where that is done in practice?—No, I do not, except with the creameries.

5756. You refer to the quantities of separated milk sent to the towns from these creameries at a particular season; where does it go at the other seasons when it is not sent to those towns?—It is being made into oleine cheese at that time.

5757. It is then used by the creameries for that purpose?—Yes.

5758. That form of cheese is comparatively recent?—Yes, it has been made within recent years.

5759. Do you know whether its manufacture is increasing to a large extent?—Yes, they are getting a better price now than they ever got.

5760. Under that name?—Yes.

5761. Under the Act of last year have you had any question raised as to the legality of continuing the sale under that name?—They are making it just now, and selling it under that name, and getting a better price than they ever got before.

5762. At present they are selling it as oleine cheese?—Yes.

5763. Not under the title prescribed under the Act, as margarine-cheese?—Under the title prescribed by the Act.

5764. Then it is sold as margarine cheese?—Certainly, it will have to be that.

5765. With reference to the uniform method to be adopted, I did not quite gather from your answer to his lordship whether you had made a definite suggestion as to what should be the method?—No, I leave that to the chemists to find out, but I think they should be able to work out some system.

5766. Do you go so far as to say that in the event of a regulation being made as the result of our deliberations here determining the limits of the milk standard that it should be a condition of that regulation, or of that standard or of those limits, that the method adopted should be an official method or a method prescribed by the Board from time to time?—I think so. It would be only fair if you laid down a limit of butter fat that you should lay down a sort of system for finding out how much butter fat there is in the milk.

5767. (*Dr. Voelcker.*) You use the Babcock tester on your own farm, I understand?—Yes.

5768. The milk which you send to the creamery is there tested again at the creamery by a Babcock tester?—Yes, that is the case.

5769. Do you find that your results and the creamery ones agree?—I have found them to agree so much that I gave up testing altogether, because I found that the creamery was giving me the actual test.

5770. Have you ever heard of any complaints that the creameries use a particular kind of bottle or a bottle which gives a particular return which is not always favourable to the farmer?—There are no end of complaints about the testing of the milk and about the percentage of butter fat.

5771. Then you cannot say whether the accuracy of your

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returns as compared with those of the creamery returns are due to your having correct bottles or to your having bottles which agree with the creamery bottles?—No, that is a thing which I cannot say.

5772. All you trouble about is to have bottles which give consistent results?—Yes.

5773. But the whole lot of them may be wrong?—That is quite possible.

5774. It is likely that a creamery will have a bottle which shows more fat?—I do not think it at all likely.

5775. (*Professor Thorpe.*) The inference is that those furnished from Dunragit are minimum values?—Yes, these are minimum.

5776. (*Dr. Voelcker.*) Do you get paid for having a larger quantity of fat?—Yes. We are just paid exactly according to the quantity of fat that you give them. For instance, the price just now is 5½d. for 3·4, and if you produce 3·6 you just get the proportion of 5½d. more.

5777. When you speak of a standard for different seasons, I take it they will not accept milk which gives fat below these figures?—Yes, they accept it, but they just pay for it below.

5778. If you gave 2·8?—Exactly; you would be paid for 2·8.

5779. What is the use of the standard?—That is the standard, if you cause them to fix the price according to that standard.

5780. Referring to the first table that you give ranging from 1892 to 1900, are those mornings milks or evening milks?—It is a mixture of both milks.

5781. You know that as a fact?—Yes, I know that. That is the only way the creamery take it in; they only take it in once a day.

5782. In no case is there anything below 3 per cent. of fat?—That is so.

5783. Now the cows that produce that milk, are they in stalls all the time?—No. They go to grass at about the 1st May, and lie out night and day until about the middle of October; then they are in during the winter months and the early spring.

5784. These do not present such a marked variation in quality then?—No; still there is a good variation from 3·31 up to 3·92, taking the monthly averages.

5785. Did you find an improvement in the quality when the method of testing was resorted to?—Judging from these figures the thing has improved, and I know, talking with the creamery people, that they found out it did improve—that it took less milk to produce a pound of butter after they used the tester than it did before.

5786. In other words, when producers knew they were being looked after?—Exactly. It was quite the habit of a great many people to keep their strippings at home, for instance, and to make butter at home without themselves thinking they were robbing.

5787. Just the same as you found on the railway when you looked after the weight of the milk; there was an improvement there, too?—Just the same exactly.

5788. In regard to the individual tests from selected cows, I may take it that they were not very select cows but selected ones?—They were selected as thought not to be giving good milk.

5789. You could not suggest fixing a standard according to the milk yielded by them?—No, certainly not.

5790. If you had many cows of this kind where your interest was to produce milk of a good quality in order to get a higher price, would you not be induced to get rid of them?—Certainly.

5791. And you would not think it a hardship to be asked to have to do that?—No, I would not; it would be my own interest, I think, to do it.

5792. Your experiments agree very much with those of Mr. Speir with regard to the rather small degree of influence of food on quality?—Yes, that was done before Mr. Speir tried any of his experiments.

5793. But you agree with him?—Yes, I agree with him. We talked over this matter at the time.

5794. Over what period did you try it?—Several weeks in the winter and spring.

5795. At different times of the year?—No, it was all in the spring time, in the early part of the year that I had these experiments on feeding.

5796. You say that, as a rule, the cows get nothing but grass during the summer?—It was done chiefly for curiosity.

5797. So that the milk here produced was taken under conditions which give you the lowest quality of milk that you would ordinarily get?—Exactly. That was just the time we were getting the lowest quality.

5798. Grass feeding—no artificial food?—That is so—during May and June.

5799. During the time of year when you would produce the lowest quality?—This was not grass feeding; it was in the spring of the year before grass feeding.

5800. This is the time when your experience tells you the quality is going down?—This is the time of the poorest milk.

5802. You mentioned that you got over the difficulty of the railways with regard to the locking of the churns?—Yes.

5803. Have you ever had any difficulty, since you introduced this plan of having the milk weighed, in that you got a short quantity sent?—I have not weighed it for a long time.

5804. Had you previously any complaint with respect to shortness of quantity?—Yes, I was losing a few gallons every day for several weeks in succession.

5805. Where was the milk about which you had these complaints sent to? Was this the milk sent from your farm?—Yes.

5806. Where to?—To Liverpool.

5807. Do you send from your farm direct to those large towns?—Not now, but I did at that time.

5808. At this time you used to send direct from your farm to certain large towns?—Yes.

5809. Did persons to whom you consigned the milk ever insist upon a certain extra quantity being given in the cans to make up for anything that was lost?—No. I never had the slightest difficulty in that respect.

5810. You never had that difficulty?—No.

5811. They did complain sometimes of the shortness of the quantity?—Yes, they did, at first.

5812. What was the quantity that the churns held?—They held from 16 up to as high as 20 gallons.

5813. In the case of a 16 gallon churn it was quite sufficient for you to fill it up to the mark indicated by the 16 gallons?—Yes, quite sufficient.

5814. But you never gave anything over?—There might be a little.

5815. You took care not to get it under, I suppose?—No, not under.

5816. You would have heard of that?—Yes, very soon.

5817. The adoption of the system of weighing the milk has got rid of all the difficulty?—That got rid of it at once—just at once.

5818. You consider that even when you consign a milk by weight it is not necessary to do the locking?—I do not think so.

5819. Is that not open to objection?—That it might be watered?

5820. That on a very hot day in the summer a thirsty porter might take the lid off, and put a little water back?—Yes, but there is no complaint now at all—no complaint whatever. I never hear of anyone complaining of losing milk on the railway now.

5821. The fact that it goes by weight acts as a deterrent?—It does not go by weight now—not at all. I am speaking for myself there, I am not speaking for the country generally. This is a particular case of my own where this happened in sending milk to Liverpool.

5822. Do you never take the weight occasionally yourself?—No, I am not sending it there now.

5823. Your system has altered?—Yes, I am near the creamery, and I am sending it there now.

5824. When you did adopt this system of weighing the milk did that lead to any particular trouble on the farm?—Very little.

5825. I should have thought your men might have objected to weighing every can, did they not?—I do not think so. I never had any trouble with the men in that way.

5826. What did you weigh them on?—Just an ordinary steel yard, one of these balance machines.

5827. That would not exist on a small farm, would it?—Yes.

5828. A Scotch farm do you mean?—Yes; of course I could not speak for English farms.

5829. You have spoken of your belief that occasionally separated milk gets mixed with other milk; is that done by farmers at all, do you think?—I do not think so; they have no separated milk.

5830. That is what I was going to ask you; there are no separators on those farms?—No, it is all separated in the creameries.

5831. So that would not be a form of adulteration practised by a farmer who wished to adulterate?—No, I do not think so.

5832. What would he do?—I do not think he would adulterate at all.

5833. You are speaking of Wigtownshire, of course?—Yes, I am speaking of Wigtownshire.

5834. Is the reputation of the milk sellers equally good in Wigtownshire?—That is the creameries you mean?

5835. The creameries?—The creameries do not sell any new milk at all, it is all sold as separated.

5836. So that any loss of reputation which is attached to the milk must be attributed to it when it comes to England, I suppose?—There is not much of it comes to England, it most of it goes north.

5837. To Glasgow and places like that?—Yes.

5838. And there possibly it does meet with something?—It may, I think.

5839. (*Mr. Cowan.*) In connection with your feeding experiments do I understand that you found that it did not increase the quality of the milk to any extent?—Not to any appreciable extent.

5840. Did it not do so for a time?—No. I do not think it made a marked difference. You see the food was pretty good; it is albuminous food.

5841. Did you find it increase the quantity to any extent?—Yes, there was a slight increase in the quantity. I am sorry I have not the quantities. I found that the different feedings did make a difference in the quantity more than quality.

5842. You think that the food of the cow does not mean very much in improving the quality of the milk?—I do not think so.

5843. Your association has recommended 3 and 8·5?—Yes.

5844. I think you stated in answer to Professor Thorpe that personally you would go up to 3·25?—Yes, I would be inclined to go to 3·25.

5845. Would your association back you up in that, do you think?—I am not quite sure that they would. I think the majority might, but I am not quite sure that they all would.

5846. There is one point I would like to know; what is the feeling of the farmers in Wigtownshire about their responsibility for the milk that they send to the large towns—where should it cease?—When it leaves their charge.

5847. That is at the station of delivery?—Yes.

5848. But is that the case at the present time?—No.

5849. Is there a strong feeling amongst the producers in Wigtownshire that it should cease at the place of delivery?—The feeling is that the farmer loses control over the milk at that time, and it would only be fair that he should lose responsibility for anything that should happen afterwards.

5850. Are you speaking altogether about testing your milk through the Babcock; have you ever sent milk to the public analyst?—Yes, I have sent samples to the public analyst.

5851. How did you find the test to stand between the Babcock and the public analyst?—They came pretty near, it may be not exactly, but they came pretty near for all purposes—within 0·1 per cent. sometimes, it may be a little more, 0·15 per cent.

5852. Do you think for all commercial purposes that the Babcock is quite a sufficiently near test?—I think so.

5853. In the case of a man being brought before the court, would you consider that the results obtained by a Babcock tester would be sufficient?—No, I do not think so.

5854. You depend then on the chemist?—I think so, unless it is brought to be more of an exact thing than it is accounted to be at present.

5855. Speaking about cream, you seem to follow Dr. Falconer King's method of having a high percentage for cream?—Yes. I think so, if people buy cream they are entitled to get it.

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5856. It would upset a very large business in Glasgow, according to evidence that we have had before us?—It might possibly, but perhaps if the Glasgow people were getting a better sample of cream they would not care to go back to that sort that they are using just now.

5857. You would not suggest lower than 30 per cent., would you?—I am not sufficiently versed in cream to say; it is merely an opinion of my own.

5858. Is there an immense quantity of separated milk coming from Wigtownshire from the creameries there to the large towns?—I should think it would be thousands of gallons to-day—just now, and for several months now.

5859. (*Dr. Voelcker.*) As separated milk?—Yes. There are six creameries, and I do not think I would be overstating it when I say that at least there would be a thousand gallons from each creamery—certainly more from some of them, I know.

5860. (*Mr. Cowan.*) Can you give us any idea what becomes of that separated milk after it leaves the creameries?—I have no idea. I know it is dealt with by men who are working both classes of milk—both new milk and separated milk. They are dealing with both kinds of it.

5861. Those are the milk sellers in the large towns who buy that separated milk?—Yes, they buy it.

5862. You do not know how they use it?—No, there are two men in Glasgow who are agents for the different creameries, and most of the separated milk passes through their hands. They are the Kennedys. They are well-known men in Glasgow. One is agent for the United Creameries, Limited, and the other is agent for the Wigtownshire Creamery.

5863. (*Professor Thorpe.*) Is that Mr. Hugh Kennedy?—Mr. Hugh Kennedy is agent for the Wigtownshire Creamery, and Mr. Robert Kennedy is agent for the United Creameries, Limited.

5864. (*Chairman.*) I may perhaps, while we are talking of Mr. Kennedy, say that he gave it as his evidence that the milk produced from Ayrshire cows generally shows a very low percentage of butter fat, varying in quality from 2·60 to 3·30; your opinion does not quite coincide with that?—It does not agree with that at all.

5865. You approach the subject rather from a different point of view?—I approach it from the point of view of what I produce myself.

5866. (*Professor Thorpe.*) Mr. Kennedy suggested that the limit should be 2·75, on the ground that Glasgow was mainly supplied by Ayrshire cows?—I have just shown that Ayrshire cows do not produce milk of a low standard.

5867. What I want to get from you is that you do not agree that the limit should be pitched so low as 2·75 from the circumstance that Glasgow is supplied from Ayrshire cows?—Certainly not.

5868. (*Mr. Cowan.*) How long have you been connected with dairying in Wigtownshire?—Longer than I like to tell, I think; since ever I have known anything; for the last——

5869. Thirty years?—Thirty years nearly—not quite, but nearly—between 20 and 30 years.

5870. (*Mr. Barham.*) Your Associations both agree upon recommending 3 per cent. of fat and 8·50 of non-fatty solids?—Yes, that is it.

5871. You were asked, or we were asked, to infer from the wording of your *précis* that they would probably consider a higher standard than that as more favourable?—Yes, that is so.

5872. You give us a list of the averages of butter fat found in milk during the whole months of a number of years?—Yes, that is so.

5873. Those figures show an average of both meals, and also the average of the whole month for all the supplies?—For the whole supplies, for every drop of milk that went into the creamery; and it all goes in at one time of the day, so that both meals are mixed. They are sent in separate cans to the creamery. The method of testing, I may explain, is that it is emptied into a can and weighed. The warm milk is emptied into a can and weighed, and the cold milk is simply afterwards emptied into this can, and the spout is changed, and it is mixed up, and these samples are put into a bottle and kept for a week, and the thing is tested at the end of each week. It is tested four or five times a month, as the case may be.

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5874. There is some preservative put in the bottle to cause it to retain its freshness?—Yes, a little.

5875. So that instead of testing it day by day you test the 14 samples at the end of such week?—Yes, that is the case.

5876. As the result of that you have here 3·21, 3·22, 3·31, 3·22, 3·26, 3·30, 3·31, 3·31, 3·31, 3·30, and 3·29 as the averages of the months over which they were analysed?—I do not see these figures.

5877. Begin again, and take 1892?—I have just explained that these are lower.

5878. You have put them in here, and therefore we can deal with them?—Certainly.

5879. In 1892 you had 3·44 as the average reading for the whole 10 months taken?—Yes, that is the case.

5880. But it included 3·22, 3·15, and 3·19?—Yes.

5881. The next year you had 3·31, 3·22, 3·26, and 3·30 in certain of the months?—Yes, that is so.

5882. And then we go on to 1896, when you had 3·31. I do not propose to take any figures except 3·31, and there are others approaching them. In 1897 you had 3·31 again; in 1898, 3·31; and in 1899, 3·30, 3·29, and on two occasions you get what is very nearly approaching to 3·30, namely 3·36 and 3·37?—Yes.

5883. As these are the averages I take it that half that milk must have come over those figures?—Yes.

5884. And half below those figures?—Yes, there will be a considerable quantity under and a considerable quantity over.

5885. If half the milk supplied to the whole of that factory was below 3·30, how can you possibly recommend for your brother farmers that we should make a standard of 3·25?—But I have never said that half the milk was under 3·30, because I am aware it was not. The milk that came in shows the averages, which were very equal indeed. Just read these figures, and you will see that there are only a few samples below these figures, and a very few samples above, the one counteracting the other; but the bulk of the samples run about the figures you get there. I should say seven-tenths of the samples run about the figures you get there, and the other three-tenths will be up and down.

5886. I do not know whether Dunragit has given you those figures, but you are asking us to understand that seven-tenths, or a very large proportion—at all events more than two-thirds—of the milk would be of one regular quality?—Pretty nearly, yes.

5887. Not varying more than 0·1 perhaps?—Perhaps more than 0·1; perhaps 0·2 or 0·25.

5888. If it varied as much as 0·25 would it not come back to where I said?—I do not think so.

5889. 0·25 from 3·30 would bring it a good deal below 3·25, the standard you yourself recommended?—Between the lowest and the highest; I do not suppose it would vary very much lower than that.

5890. I do not want it to vary any more. All I want to point out is that if it varied to that extent, a good deal of the milk which came into the factory would be less than 3·25?—Yes, on the whole it would be, but not a great quantity. I know there was not a great quantity, because I saw the figures on their books.

5891. What I say is, or what you tell us is, that more than two-thirds of the milk came in of a regular quality?—Yes, quite that of a regular quality.

5892. The other portion varied?—Yes; some went up a little bit, and some went a little bit lower.

5893. At all events, to the extent of one-third, or a considerable part of that extent, would vary below 3·30?—Not below—below and above.

5894. There would be one-sixth that would vary below 3·30?—There might be.

5895. But that is over 15 per cent.?—Yes.

5896. You see by your standard that you suggest of 3·25 that that would work out to 15 per cent. of the whole year's supply of Dunragit?—I think it is possible that that would bring them up close to the other.

5897. I thought you just said that they could not alter it by feeding?—Neither could they.

5898. Then they could not bring it up by that?—No.

5899. Then they would have to eliminate all their poor cows?—Certainly.

5900. And your poor cows you show us by your next table, would be 25 per cent. of the whole?—It might be.

5901. More than 25 per cent. according to Table 6?—Yes, a good portion of them would have to go. You see these are pulling down the cows that are giving the 4 and 5 per cents.

5902. Exactly, I quite agree with you, and granting the facts as you are laying them down, I am not finding any fault with your conclusions; by Table 6 you show that if the poor cows were eliminated they would have to eliminate 25 per cent. of the cows?—Yes, and I think it would be a good thing too.

5903. I daresay; but now that cannot be done in five minutes?—No, it cannot be done so, but it can be done in a year or two.

5904. In a few years?—Yes.

5905. It takes three years to make a cow, of course?—Yes.

5906. And if you take away 25 per cent. of the present cows you must have four or five years to replace them?—I do not mean to do the thing just at once.

5907. Exactly; but we are proposing to introduce a standard that will come into operation perhaps within three months or six months, or may come into operation within six months?—Yes, but I understand the standard you propose is 3 per cent. I do not suppose that would interfere with any of my own friends at all.

5908. But you are suggesting to us here on your own behalf that it should be 3·25; that is what I am taking exception to. If you are content with 3 per cent. on your own behalf, and also on behalf of your friends, I will not press the matter any further; I understood you to recommend 3·25?—Yes, and I do yet, too.

5909. Then I only want to show you that we must wait, and you yourself say we must wait, four or five years before we can improve the cows up to that standard?—Yes.

5910. So that, although you want 3·25 you would be content to wait for that period?—I think so; I think the farmers should be educated up to that.

5911. (*Professor Thorpe.*) With respect to that last, do you think there would be really any practical difficulty to the farmers if the standard of fat were to be raised to 3·25?—I do not think it would be very great.

Mr. F. J. Lloyd.

Mr. F. J. Lloyd, called; and Examined.

5912. (*Professor Thorpe.*) You are a Fellow of the Chemical Society?—Yes.

5913. Of course that is a very high qualification I may say, as president of that Society, but still perhaps you would kindly indicate to the Committee what your other qualifications are?—I am a Fellow of the Institute of Chemistry. That is practically the only qualification I have. I hold several appointments as analyst to different societies.

5914. Would you kindly indicate what they are?—The British Dairy Farmers' Association and the Metropolitan Dairymen's Society. Then I have been engaged by the Bath and West of England Society in dairy research work.

5915. You appear here by invitation of this Committee?—Yes.

5916. Would you kindly give us some information derived from your own experience as to what we may take to be the average composition of pure milk?—In 1896 I brought before the Food Products Committee the result of the analyses of 1,330 samples of milk taken indiscriminately from my laboratory books, and of these 330 were adulterated; that was 24·8 per cent. The average composition of the 1,000 genuine samples was, fat, 3·63 per cent.; casein, etc., 8·99.

5917. That is solids not fat? Yes. The total solids were 12·62; that was the evidence in 1896.

5918. Will you kindly pardon me; with respect to the adulterated samples you say that 24 per cent. were adulterated?—Yes, 24·8 per cent.

5919. Would you kindly give us a little more information about that matter; how were these samples that you speak of brought to you? Are you a public analyst?—No, I am not a public analyst.

5920. How were they brought to you?—Those samples would have been brought or sent to me by farmers, and by buyers.

2921. In London?— Yes. I represent the dairy farmers, and I also represent the principal purchasers of milk in the metropolis, the dairymen, so that the samples which come to me are some from the country and some bought in the town, coming from the country or produced in the town.

5922. When you said that 24·8 per cent. were adulterated, of course you must have had regard to some limits or standards enabling you to deduce the fact of adulteration?—Yes.

5923. What did you take as your limits or standards?—I took for fat that the sample had over 2·7 per cent. of fat, and for solids not fat over 8·55.

5924. That is to say, therefore, 24·8 per cent. of the samples you examined fell below those limits in one or other direction?—Yes.

5925. Was the adulteration all of one character?—No.

5926. Are you able to discriminate between different characters of adulteration?—Not for those samples, I did not expect that you would wish me to; I think we can do that for later samples.

5927. Are you able to tell the Committee if the adulteration mainly consisted in the abstraction of fat or the watering of milk?—Mainly in the watering of the milk, or rather in a deficiency of the solids not fat.

5928. Were those samples received from farmers, or how would those particular samples that you are speaking of be received?—By me?

5929. Yes, I mean where did they come from; what is the origin of those 24·8 per cent. of samples?—The adulterated samples came with the others; they were not picked out at all. I simply went through my record books. I have books that hold 100 forms for the analysis of milk, and I took those books indiscriminately—a sufficient number to get 1,000 samples of genuine milk.

5930. Then they might be samples received from producers or from vendors of milk?—Yes.

5931. Have you anything more to say about your results in 1896—these must have been taken prior to 1896, because it was given in evidence before the Food Products Committee in 1896?—It was given in evidence on the 11th March, 1896. These were taken in years prior to that.

5932. How many?—Purposely in no definite year; so as to get what I may call a general average composition of the milk before that period.

5933. Over how many years would those have extended?—Say six or seven years.

5934. From 1890, we may say, onwards?—Yes, we may say from 1890; I could not be certain; it might be more than that.

5935. Have you anything more to say with respect to the samples upon which you gave evidence in 1896?—No, but I should like to mention here that there is a statement in the report of the Committee as to what I proposed should be the standard of milk. I should like to correct that statement. It reads: "Various suggestions have been made to your Committee as to the standard which it would be proper to set up. The following may be stated, namely, total solids 12·6 per cent., fat 3·6 per cent.," and then in the margin, "Lloyd 2,341." That is a mistake, because I only gave that as the average composition of the 1,000 samples of genuine milk, and I never proposed it should be a standard.

5936. Did you propose a standard at the time?—I proposed a standard at the time of 12 per cent. of solids containing not less than 3 per cent. of fat. That, I think, was proposed by me as a witness representing the Central Chamber of Agriculture at that time.

5937. We may take it that in 1896 you suggested to the Committee that the limits should be fixed at 12 per cent. total solids, of which not less than 3 per cent. should be fat?—Yes.

5938. Now, passing on to the evidence you are prepared to give relating to the last three years, would you kindly summarise that?—That evidence has been put into tabular form, and represents milk sold in London. In 1897 there were 309 samples of milk. (*See Appendix* No. XIV.)

5939. Pardon me; the table is headed "Average composition of genuine milk from members of Metropolitan Dairymen's Society"?—Yes.

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5940. What is the evidence that the milk was genuine?—The same standard as before.

5941. That is all? Your evidence of genuineness is determined by the fact that it passes the limit?—Yes.

5942. Would you kindly proceed?—Of these 309 samples the average composition was, fat 3·52, solids not fat 8·95, total solids 12·47. In 1898 there were 325 samples; the average composition was, fat 3·53, solids not fat 8·95, total solids 12·48. In 1899 there were 282 samples, the fat being 3·62, the other solids 8·98, and the total solids 12·60. The average of these 917 samples is 3·55 for fat, 8·97 for other solids, and 12·52 for the total solids.

5943. Of the milks analysed by you during these periods of three years you must of course have met with a considerable number which fell below your limit?—Yes.

5944. Have you information about those?—Those will be found in Table No. 6 (*Appendix* XVI.)

5945. Would you kindly summarise the figures there?—I presume we are confining it solely to that point?

5946. Yes, for the moment?—The number analysed in 1897 was 410, of which I reported 101 as adulterated, and 309 as genuine. In 1898 there were 417 analysed, of which I reported 93 as adulterated and 324 as genuine. In 1899 there were 313 analysed, of which 31 were adulterated and 282 genuine. I shall have later on to make a reference to the fact that some analyses in 1898, though put as adulterated, because they come below that standard were not actually reported as adulterated. That I shall explain later on.

5947. Of course this is important; what was the evidence other than that they failed to pass your limits that the milks had been tampered with?—None.

5948. You are not, therefore, able positively to say that they were adulterated?—No.

5949. It is a mere surmise on your part?—Certainly.

5950. Are you able to explain the circumstance that there was a progressive improvement in the quality of the milk over the three years as manifested by the circumstance that the number you reported as adulterated became progressively less; how was that brought about?—I do not know that I could give any definite ground, or that I have any sufficient grounds for stating why that is so.

5951. You have no reason to suppose that cows were eliminated or that farms were eliminated?—No, I have no reason to suppose that.

5952. Have you any reason to believe that the Metropolitan Dairymen's Society continued to deal with the same farmers throughout that period?—No.

5953. Have you anything further to tell us with respect to the analysis of these figures in Table 6?—Yes, later on. I want, first of all, simply to give the evidence of what I call good milk.

5954. Turning to the evidence you are able to afford us as to the composition of milk, will you deal with that from the Somerset herds?—These were herds of cows kept for dairy purposes in Somerset. There were, as a rule, over fifty cows in each herd; they were kept out on the pastures nearly the whole time—perhaps in April at times they were in the sheds. That I know to be the case in 1895, where the fat is exceptionally high in the month of April. These analyses were taken in many cases every day, and in some cases every week, so that they represent the composition of the milk of large herds on different farms for those six years, 1892 to 1897. It will be seen that the average percentage of fat for the months of April to October in 1892 was 3·36, and total solids 12·31; for 1893, 3·35 of fat and 12·32 of total solids; for 1894, 3·66 of fat and 12·73 of total solids; for 1895, 3·78 of fat and 12·86 of total solids; for 1896, 3·90 of fat and 12·86 of total solids; and for 1897, 3·76 of fat and 12·69 of total solids. Taking the average for the six years the fat was 3·65 and the total solids 12·64, so that the solids not fat would have been 8·99. (*See Appendix* No. XV.)

5955. Here, again, I notice that there is a tendency to an improvement from 1892 to 1896, and then there is a slight decrease in 1897. What causes were at work there, do you imagine, to bring about that gradual rise in the amount of fat?—There are various causes which I think have influenced that. The pastures were not all the same, and the herds were very different. Each year it is a different herd and a different locality. The pastures vary, the herds vary, and the care and skill with

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which the cows have been bred or bought vary, also the seasons vary; some seasons would give better milk than others.

5956. Do you imagine that there was any selective process at work?—None whatever, because the farmer who supplied the milk in 1893, for example, did not know in 1892 that he was going to do so.

5957. What was the particular reason for confining the analysis to seven months only of the year?—Because they were only made during those seven months, which is the cheese making season. I may say that in Somerset, where they make Cheddar cheese, the cows are mainly brought to calve early in the year, so that they may get the milk for this cheese making. Therefore we get the milk over the main portion of the milking period. You will see that it increases in quality, so that had I continued the analysis further it would probably have raised the average quality of the milk. Having brought these figures before you it is rather interesting to note that: If we take the figures up to 1896 we get 3·63 of fat and 12·62 of total solids as the average composition of genuine milk; if we take the figures of the last three years for London milk we get 3·56 of fat and 12·42 of total solids; and if we take the figures of these six years in Somerset we get 3·65 of fat and 12·64 of total solids, so that in all these cases there is only an inappreciable difference with regard to the fat and total solids.

5958. Does this exhaust all you wish at once to say with respect to these results from dairy herds in Somerset?—Yes, I think so.

5959. You have some evidence to offer us as to the conditions which affect the composition of milk?—Yes.

5960. You divide those into uncontrollable conditions and controllable conditions; would you tell us first of the uncontrollable conditions?—I venture to think that one of the first uncontrollable conditions is the breed of the cow. The most complete results which I have obtained—and I am speaking solely of my own work before the Committee—are the analyses which I have made of the milk of the cows of various breeds at the Dairy Show as shown in Table No. 3. There it will be seen that the breeds themselves vary considerably as to the quality of the milk which they produce.

5961. (*Chairman.*) Are these the milks of the cows that were shown at the show and milked there?—They were shown at the Dairy Show and milked there before the stewards, and the milk analysed morning and evening; and these are the results for some years.

5962. The Committee has decided that they would not go into the figures brought from any dairy show, because we consider that the conditions under which the cows were at the time really did not represent the ordinary condition of cows in the country?—That is quite so.

5963. So we thought we would leave out of consideration all questions of dairy show cattle?—I quite understand that, and it is quite right; still, it is the only means of showing the difference between the breeds, because here all the breeds would be under the same conditions, so that I think the influence of the breed would be marked, though I quite agree that the influence of the dairy show is very great on milk itself.

5964. It is hardly one we could base any real conclusions on?—No, certainly not.

5965. (*Professor Thorpe.*) Perhaps you may be able to say this from your experience—what I may regard as the qualitative indications indicated by those figures are borne out when the cows are under normal conditions?—Yes.

5966. Is that your experience?—That is my experience. Here I should also like to state that I do know from experience that foreign cows give milk which is far poorer in quality—especially, say, Dutch cows—than any of the breeds which are natural to our own country.

5967. Do you mean poorer in quality as regards fat?—And total solids too.

5968. (*Chairman.*) Do you know that from results taken at dairy shows, or in other ways?—From dairy shows and also from other information where I have had the milk of foreign cattle brought to me by the owners.

5969. From their own farms?—From their own farms.

5970. (*Professor Thorpe.*) Now, turning to the composition of the milk of abnormal cows—I suppose you mean really abnormal milk, or are the cows abnormal, or what is it?—I am afraid that that is a problem which science has yet to solve. There are certain cows in the country which give milk of abnormal quality, and it is a very important factor, because I do not think at these cows are sufficiently well known. Farmers are not aware that they may possess cows of this description, and several of these cows might materially affect the quality of the milk produced by a farmer, and he might not know why it was. Therefore, I want to draw special attention to this fact—that there are cows giving milk of abnormal quality. If for one moment you will pass down to the Dairy Show table, I think I may mention these figures. (*See Appendix* No. XV.)

5971. (*Chairman.*) Yes, to explain your own evidence, but we do not want to go too much into the Dairy Show tests?—You will see here in Table 5 for 1897 the sixth cow gave solids not fat 8·37 in the morning and 7·99 in the evening. Take 1898; you will find there that the fat was 2·47 in the milk of the first cow and 1·89 in that of the second cow. Now, it is proved that the second cow is peculiar, because the fat in the evening's milk only rises to 2·95, and if that morning milk had been exceptional from some momentary cause it would have been rectified by the evening; so that I have not brought before the Committee any exceptional case like that. Then, the last cow in the first column of 1898 you will find is a very exceptional cow, giving 2·12 of fat and 8·18 of solids other than fat in the morning and 3·61 of fat and 8·11 of solids other than fat in the afternoon. I mention these figures because they are figures such as could be repeated to a very large extent with a very great number of cows that have been exhibited at the Dairy Show, and which produce abnormal milk. I mention them also because I have had an opportunity at the Dairy Show of having some of these cows examined by Professor Axe to determine whether it was disease which caused this abnormal milk. He failed absolutely to find any sign of disease in a cow which was producing most abnormal milk. He has not examined all of them, because, of course, it would be more work than I could ask him to do.

5972. (*Professor Thorpe.*) Now, turning again to Table 4, which gives the milk of abnormal cows, I think you have not actually figured this out; but, perhaps, you may be able to tell me whether the ratio of the fat to the casein is preserved substantially when compared with the ratio of the fat and solids not fat in normal milk—in other words, whether it is not that the materials of the milk are more dilute, and that there is a larger proportion of water?—No, I have not worked it out. I do not think that could be maintained; in fact, from my study of this abnormal milk it seems to me that every cow has its own peculiar abnormal condition.

5973. What I think you mean to imply is that there is some pathological condition which affects the secretion of one or other constituent in the milk; is that so?—Which affects the general secretion—not one or other constituent, but the general secretion.

5974. But if it simply affects the general secretion the ratio between the individual constituents may be maintained in the so-called abnormal milk?—Yes.

5975. And all that you are getting is the normal products diluted with a larger volume of water; is that so?—No, that, I think, cannot always be maintained. They are so irregular that you could not state that it was a diluted milk, so to speak, which was being manufactured, but it is a milk essentially abnormal. Sometimes the fat will vary; at other times the other constituents will vary, and I do not think that between themselves the various constituents of the solids not fat are always uniform. There is a certain amount of relation, but it is not sufficiently constant to say that abnormal milk is milk with an excess of water. The figures which are given in Table 4 are all from cows on the farm fed in the ordinary way, and generally with other cows, and in the last three cases a deliberate attempt had been made, by special attention and feeding, to alter the composition of that milk—and had failed.

5976. You still would regard, then, as an abnormal milk a milk which contained 12·2 per cent. of total solids with fat 4·39 per cent., because the solids not fat were as low as 7·8?—Yes.

5977. You would regard that still as an abnormal milk?—Certainly.

5978. Have you anything more to tell us with regard to Table 5?—Not as regards abnormal cows.

5979. The next point which you say is an uncontrollable cause as affecting the composition of milk is the time since calving?—Yes, that is a well-known fact, which we need say very little about except that the time since calving does affect the composition of the milk. It is poorer when they commence to give milk, and it gradually increases in quality to the

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end of the milking. It only affects the question of a standard in so far as there is the possibility of a man whose cows all calve simultaneously having to sell his milk instead of utilising it. Of course, ordinarily a man who sells milk takes care to have the cows calving in rotation.

5980. How soon after the calving would the first of these samples be taken?—Some of the cows yielding this April milk and the May milk are only just calved, that is to say, it contains the very first milk (not colostrum) which they yielded; they were calving down at the time.

5981. Now we come to the controllable causes?—There are three controllable conditions which affect the composition of milk. The first is the interval between the milkings. The table, which shows the composition of the morning and evening milk of the cows at the Dairy Show, indicates pretty fairly what may be considered the difference between the composition of morning and evening milk under nearly the most favourable conditions. There were eleven hours and thirteen hours between the milkings, and it is very difficult to get closer to the exact period. You will see that under those conditions, taking the average at the bottom of the page, that the morning's milk contained 3·57 of fat and 8·93 of other solids; the evening's milk containing 4·15 of fat and 8·88 of other solids. These are for Shorthorns only, because they would probably yield the milk of lowest quality in the morning.

5982. These are all taken as the results of tests at the Dairy Show?—At the Dairy Show at Islington—one breed only for the past three years.

5983. Speaking generally, of course, as your answer to the Chairman indicated, you are quite aware of the possibility of the milk being, I may say, abnormal under those circumstances?—Yes.

5984. If the milk is abnormal under those circumstances, in what direction does the abnormality go, does it tend to increase or to diminish the amount of fat, for example?—As a rule it tends to diminish the amount of fat in one milking but to make up for it in the next.

5985. Then that discrepancy, of course, would be overtaken in the analysis or in the averages, as shown here?—Quite so.

5986. Now, as to the influence of feeding on the composition of milk, what have you to tell us?—There is, as the Committee are well aware, considerable difference of opinion as to whether the composition of milk can be affected by feeding. My own experience, extending now over many years, leaves me without a shadow of a doubt that the composition of milk is affected and can be affected by feeding. For instance, a dairyman who wishes to manufacture the largest quantity of milk possible, irrespective of quality, can feed his cows upon foods which have a forcing effect, such as grains, and produce that quantity, whereas another farmer who wishes to maintain the quality of his milk can so feed his cows as to increase the quality rather than the quantity. I have not troubled the Committee with figures, but I am going to state what is an actual fact, within my own experience, where a farmer was supplying milk to a buyer who, upon analysis of his milk, finding it deficient, refused to purchase the milk. The farmer came to me, and my analysis confirmed the analysis of the buyer. The milk was so poor that he was justified in declining to purchase it. I advised an alteration in the food of the animals, and that alteration was made; but it was one month before the milk was capable of being put on the market again, as the result of the improvement due to this feeding, because the cows had been improperly fed for such a long time that it took them one month to recuperate themselves before the effect of the food was felt on the milk. I venture to think that most of the statistics which go to show that food has no effect on milk fail, because the experiments have not been carried far enough to counterbalance that peculiarity of the animal to first utilise the food for itself before it utilises it for the milk. This is not the only case. It is perhaps the most striking case that I know of, but it is not by any means the only case. It frequently arises that the milk of a farmer is refused by a purchaser in London, and the farmer comes to me to know the reason, and I find that he can alter that milk by judicious feeding, so that it will be accepted.

5987. Another controllable cause, at least you put it down as a controllable cause, but which is one perhaps that may give rise to a difference of opinion, is the influence of drought?—I do not say we are going to control the drought, but I think we can control the effect of the drought.

5988. Perhaps you would kindly indicate to the Committee how that is to be brought about?—The effect of drought, of course, is generally felt at a time of the year when the farmer considers it his duty to have his cows out on the pastures, and he persistently keeps his cows on the pastures, although the effect of the drought on those pastures has been such as to render them unsuitable food for the cow. Very often cows in that condition will be supplied with an artificial supply of water, and if they cannot fill themselves with dry food they will with water. The effect of the drought certainly is very striking. As a rule it tells mainly on the solids not fat, and at the same time I have known the fat increase, which I think is due to a diminution in quantity taking place with an increase in quality, that increase being limited mainly to the fat, and not being felt by the solids not fat. We shall find in these tables a great many instances of the effect of drought. Look at this table (*Appendix* XVI): In the month of August, 1898, there were nineteen samples which fell below my standard, and yet these nineteen samples contained on an average 3·93 of fat, the average solids not fat being only 8·27 and the total solids 12·20.

5989. (*Mr. Barham.*) That is the average of the nineteen samples, is it?—Yes.

5990. (*Professor Thorpe.*) But even there the total solids were 12·2?—Yes, because the fat is so very high—it is nearly 4 per cent. of fat.

5991. Thirteen of them had over 12 per cent. of total solids?—Yes. Then, in 1898, the same year, in September, twenty-eight of the thirty-nine adulterated (so-called) samples had over 12 per cent. of solids, and thirty-two out of the thirty-nine had over 3·5 per cent. of fat; five were undoubtedly adulterated samples—that is to say both the fat and the solids showed there was no question that they were adulterated.

5992. Do you mean absolutely adulterated, or adulterated from your point of view?—I consider that when a sample is adulterated from my point of view it is absolutely adulterated; I mean to say there is no other method of judging.

5993. It falls below your limits, in fact?—It falls below my limits.

5994. Why should that not be placed among the category of abnormal milks?—It might be if you could prove that it came from an individual cow. The remaining thirty-four had fat 3·91, solids not fat 8·41, and total solids 12·32. Then, again, in August, 1899, though a smaller number of samples sent me; eight fell below my standard, seven of them, however, had over 12 per cent. of total solids, and seven over 3·5 per cent. of fat. I think I may say that every year when there is a drought there is always trouble, owing to the fact that if milk is sold to buyers in towns containing such a small quantity of solids not fat there is a risk of the seller of such milk being prosecuted.

5995. For admixture with water?—For adding water. A case was brought to me some years ago where a farmer was prosecuted for adding water to his milk. I went to his farm, I saw the cows milked, and I analysed the milk, having taken several samples. That milk had over 4 per cent. of fat and only 8·1 per cent. of solids not fat. The public analyst had reported it as containing added water.

5996. For the moment, before I pass on to the question which is in my mind arising out of what you have said, is it a general law, so far as you have observed, that in these times of scarcity of water there is an increase in the amount of fat?—Yes, so far as I have observed, as a rule.

5997. Periods of drought, of course, usually occur during the hot season of the year?—Yes.

5998. Is there any connection between the hot season of the year, independently of the drought, and the amount of the fat yielded by the animal in the milk?—Not other than the usual increase from the time since calving. I do not quite grasp what you mean.

5999. I mean is there any direct influence of temperature upon the production of fat?—Yes.

6000. There is?—Yes.

6001. If you kept a cow warm even during the winter—if you kept her at a summer temperature, we will say, during the winter—would she still continue to give a relatively high proportion of fat?—Yes, a higher proportion of fat than if kept at a low temperature.

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6002. Would that affect the solids not fat?—That I cannot answer; the question never entered my mind, and I cannot remember data to give you an answer.

6003. What I want to get at really, and what is in my mind, is this—what is the physiological import of this; is it that in cold weather, or when the cow herself is cold, she is using up material to maintain her animal heat which otherwise would be made into fat; is that the inference?—That is my opinion certainly, and all my experience goes to show it. I know where experiments have been carried out of keeping cows under artificial temperature, artificially warmed—that is to say, in a warmed shed—the milk has been proved to be of a better quality owing to the artificial warmth of that shed.

6004. And that mainly affects the amount of fat?—Yes, I think that mainly affects the amount of fat.

6005. The other question which was immediately in my mind was this—does not what you have told us rather indicate that if we have to eliminate the effect of drought in determining our limits, that the limits should be based upon total solids with a defined proportion of fat?—Not necessarily. Of course, that is the simple way out of the difficulty; but you might limit your solids not fat with a proviso that where the total solids amounted to above a certain standard the apparent presence of water should not be considered as such.

6006. Yes, we could do that, but I am rather thinking of how we could obviate such an occurrence as you have told us of where an analyst, having regard to certain limits which he would have to have regard to, as fixed by the Board of Agriculture—assuming that they do fix such limits, and that the Board of Agriculture determine that the amount of the solids not fat should be fixed at a particular limit—where an analyst having regard to those limits would have no option but to point out that the milk was presumably watered?—Not unless the standard is specially fixed—and I shall read later on the wording which I have drawn up to meet such a case as you are now drawing my attention to.

6007. Very good; assuming that we suggested a limit of 8·9 per cent. of non-fatty solids, and that became a regulation, and the analyst having, as he is directed, to have regard to that regulation, he would have no option but to report that such a milk as you have drawn our attention to would presumably have been watered?—Unless you have a proviso to your limit.

6008. Such as you propose to indicate?—Yes.

6009. Perhaps you would kindly tell us what are the objects to be attained by a standard; in the first place, may I ask whether you are of opinion that these standards should be fixed at all?—Yes, certainly.

6010. What are the objects to be attained by fixing these standards or limits?—I hope one object that does not affect me would be to let the public analysts have something to guide them, for I think they want it; but still, that is only an aside. From my point of view, the necessity for a standard is to prevent the addition of machine skimmed milk to whole milk and to prevent the addition of water. Those are the two objects we have got clearly to keep in our mind and nothing else, so far as I can see. Whatever standard is fixed must exclude the milk of abnormal cows. I think, moreover, that it must exclude the milk of cows improperly fed, whether that improper feeding is due to drought or to improper feeding at home; and I think myself that it will have to exclude the milk of cows which are milked at very uneven intervals. There are, I believe, in some parts of the country cows which are milked at eight hours and sixteen hours intervals, and, undoubtedly, the milk of a cow which has not been milked for sixteen hours will show an exceptional composition. Whatever standard is fixed must affect a certain amount of what may be called genuine milk, or otherwise it will permit and legalise the dilution of the average milk of the country by water and machine skimmed milk. Those are the two stools it appears to me which the Committee have to choose between as best they can, and a very difficult position it is. Either you must fix a standard which will legalise adulterated milk, or if you prevent that, you must, of necessity, be hard upon a certain number of producers of milk, which they may call genuine but which is certainly of such poor quality that I doubt whether the term genuine milk is justified.

6011. Take one of the several points that you have mentioned. Of course, the abstract desirability of there being something on which everybody should agree, analysts, Court of Reference, and everybody else, goes without saying; certainly Mr. Falconer King, who has given evidence this morning, will, I am sure, cordially re-echo what you have said as to the desirability, at all events in his case, of having some authoritative standard fixed. Now, as to the question of requiring milking to be done at fairly definite intervals, or regular intervals, I mean intervals which shall more nearly approximate to uniform intervals in the twenty-four hours; is that not a condition of things which it would be impossible to obtain in a very great number of cases; are not the conditions of supply to towns such that no approach to what I suppose would be the ideal condition of milking at actually equal intervals is possible?—Yes, I believe that is so.

6012. How do you propose to overtake that difficulty?—Of course, it is a difficulty, and any proposition to overcome it would only raise another. But you can milk three times a day, and I think myself that rather than the milk of the whole country should be lowered to a standard which is evidently far below anything which we consider just, the farmer should be compelled to milk three times a day. It is a great hardship, undoubtedly, but the number whom it would affect is comparatively small as compared with the great mass of the population who are consuming milk and who have a right to say we will have milk of good quality.

6013. Yes, but on your showing, waiving aside the possibility of fraud in connection with having to fix a low standard, we will say, in reference to the morning's milk, if we can devise means by which the consumer shall get the whole product, during the twenty-four hours he has got the average product of the cow, has he not?—Yes.

6014. That is to say what he loses in the morning he gains in the evening?—Yes, if he gets it.

6015. Do you think it is impossible to devise means by which he should get it?—Yes.

6016. That is your deliberate conviction?—Yes, absolutely. You could, of course, fix a standard for morning's milk and evening's milk, but how are you going to prove that it is morning's milk? Of course, you might say that a farmer who cannot milk except at uneven intervals should have the means of keeping the two milkings together and should vend them together.

6017. Do you see any practical difficulty about that?—There are difficulties, undoubtedly, especially in hot weather, and under the conditions which a great many farmers possess for cooling milk. I think there would be very great difficulty.

6018. Are you aware of the conditions which a farmer has to fulfil who sends his milk once a day only to a creamery; what does he do in such a case as that?—I cannot answer that from my own knowledge.

6019. But you are aware that a very large number of milk producers do manage to sell to creameries the produce of their two milkings, and to deliver it on one occasion?—No, not to my own knowledge.

(*Professor Thorpe*) (*to Mr. Ralston.*) The farmers around you, Mr. Ralston, were engaged in the delivery of very large volumes of milk, were they not?

(*Mr. Ralston.*) Very large quantities of milk.

(*Chairman.*) You are rather unusual, are you not, in delivering only once a day into a creamery?

(*Mr. Ralston.*) No, I do not think so.

(*Chairman.*) I have been over a great many creameries in Ireland, and I never saw it there once, and it is not so in my own creamery.

(*Dr. Voelcker.*) Does it not depend on the nearness to the railway station?

(*Mr. Ralston.*) I may say all the milk that goes to Wigtownshire and Glasgow and the other towns as well is only sent once a day, and is never sent twice—never by any chance is it sent twice—it is always sent at one time.

6020. (*Professor Thorpe*) (*to the Witness.*) You have a considerable knowledge of the economy of farms; you frequently visit farms?—Yes, I visit farms, but will not set up as having a knowledge of the economy of farms.

6021. You know something of their mode of working and the conditions under which they carry on their business?—Yes.

6022. That is what I want. From your observations is there any special difficulty on the part of a milk producer in mixing the product of his beasts, so as to get a fairly uniform quality?—For the one milking?

6023. For the one milking?—Yes, if he has a large herd there is a certain difficulty even then. As a rule what

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they call the railway churn is about the largest receptacle they have.

6024. The object of my question is this: Of course, we can ask for nothing more than the average product of ordinary well fed, properly fed cows, but we have been met occasionally with this difficulty, that there may be in the herd a few beasts of the character you indicated giving this extremely poor quality of milk unknown to the milk producer; and it may happen, and we have been informed that it does happen, that the product of a few of these cows may get into one churn and the man may be convicted for what is the genuine produce of his cows giving this low class material. We have asked whether it is not possible to obviate that by mixing that milk with the other produce of the cow so as to avoid that possibility; is that a practicable method in farming?—Yes. It is much easier for a farmer to carry out perhaps than to determine the quality of the milk of every cow, but, in my opinion, it is no excuse for a farmer that he has these cows and does not know it. A man might just as well say that he manufactures guns, and a certain number of those guns explode because he had an imperfect machine, and he did not know it.

6025. I do not know that the simile is altogether perfect, is it?—No, it is not, but I mean to say he is responsible for an article which he is manufacturing by a machine—to a certain extent, now, we must look upon the cow as a manufacturing machine—and if he has got an imperfect machine at work he has no right to have it. The public have a right to demand something which is produced by a proper machine, not by an imperfect machine.

6026. With every desire to act honestly, with every desire to conform to that requirement, a perfectly honest farmer may now and again be subject to the humours and vagaries of a feminine creature who may play him tricks without his knowing anything about it?—My own opinion is that the cows of this description do not play tricks. It is more or less a set constant quality. I have had such cows under observation for weeks and weeks together, and I have found that it is a constant factor. I think a farmer who is supplying milk ought of necessity to know what are the kind of animals which he is employing for that purpose, because you might say that he could not tell one of those cows was producing tuberculous milk. If he does not take sufficient care to examine individual cows to see that they give milk of a good quality, how can we expect him to examine them to see that they give milk that is suitable for consumption at all.

6027. Can you expect a farmer to test the produce of every individual cow?—Yes.

6028. Can you expect him to do that?—Yes, and there are farmers doing that, and the practice will grow, and I think it is a custom that should grow.

6029. Have you anything to say about the methods of fixing a standard?—There are two methods, in my opinion, of fixing a standard. First, we may limit the fat and total solids; or, second, we may separately limit the fat and the solids other than fat. Those are both feasible methods of fixing a standard.

6030. What have you to tell us as to the relative advantages of those two methods?—Shall we take one by one, each of these methods, and see what figures we can get, first of all judging from the results which have been obtained?

6031. If you please?—Let us attempt to consider what may be a fair standard of total solids in milk. Table 6 and Table 7 I shall now have to refer to. (*See Appendices* XVI. *and* XVII.) In Table 6 we have these analyses of the genuine milk only, received from members of the Metropolitan Dairymen's Society. Here we have for each month, in each year, for the three years, a number of samples, the solids of which amount to over a certain sum. I should like, first of all, to remind the Committee that by taking that standard of 2·7 of fat as the limit at which I should report, and 8·55 as the limit at which I should report for other solids, it is quite possible for milk to pass through my hands provided it has anything over 11·25 of total solids; it is quite possible for that to pass my standard, and it would, therefore, come into these genuine samples. Let us take those genuine samples, and what do we find? In 1897 there were 210 samples which contained over 12·25 of solids, 63 over 12, 22 over 11·75, 11 over 11·50, and only 3 samples out of 309 contained under 11·50 of solids, although it would have been quite possible for 50 of them to have contained less than 11·50 and above 11·25. Now, taking 1898, we have 225 over 12·25, 51 over 12, 22 over 11·75, 20 over 11·50, and only 2 under 11·50. In 1899, when the milk certainly was of a better quality than in 1897 and 1898, 223 samples had over 12·25 of solids, 44 over 12, 12 over 11·75, 2 over 11·50, and only one under 11·50. Summarising these analyses we have 1,140 analyses, and 224 adulterated on my standard, leaving 916 genuine samples. Of these genuine samples containing solids, over 12·25 there were 658, and over 12 there were 158; so that combining those together 90 per cent. of the genuine samples which come into my laboratory contain over 12 per cent. of solids. Of the others you see 60 were over 11·75, 34 over 11·50, and only 6 samples out of the 900 were under 11·50 of solids. I think it is perfectly evident that a minimum standard, as far as the total solids is concerned, would be 12 per cent. or even over, not under 12 per cent., because I think it must be perfectly clear—taking samples indiscriminately like those—that if it were natural for milk to fluctuate very considerably between the limits of 11·25 and 12, we should have found a very much larger proportion than the 10 per cent. as showing figures between those numbers. The fact that the 10 per cent. proportion is so very small indicates clearly that naturally the total solids in milk come to over 12 per cent. Then we come to Table No. 7. In this table I include every sample, whether I have reported it as adulterated or not. So that now we shall see the effect of taking other figures. We will take the fat for the three years first. In 1897 there were 410 samples analysed, only 32 contained under 2·7 of fat, 69 contained under 3 per cent. of fat, and 126 contained under 3·25. In 1898, 417 samples were analysed, only 20 containing under 2·7 of fat, 51 under 3 per cent. of fat, and 102 under 3·25 per cent. of fat. Perhaps I ought to explain at once to the Committee that the 102 of course includes the 51 and the 20. In 1899 we have 313 samples analysed, only 6 with less than 2·7 of fat, 17 under 3 per cent. of fat, and 55 under 3·25 of fat. It will thus be seen that a fair proportion of the samples of milk contain less than 3 per cent. of fat, and yet over 2·7, namely, 79 samples out of 1,140. But if a standard of 3·25 per cent. of fat were taken we should condemn as adulterated about one-fourth of the milk now sold in London, as judged by the samples coming to me, namely, 283 samples in 1,140. With regard to the other standards, if 11·75 of solids were taken in 1897, 78 samples would be reported as adulterated; if 12 per cent. of solids were taken, 114. In 1898, 11·75 per cent. would give 57 adulterated, and 12 per cent. would give 95. In 1899, 11·75 per cent. would give 19 adulterated, and 12 per cent. would make 34. That shows that there is a considerable increase in the number which would be reported as adulterated between the 11·75 and the 12 per cent. of solids. Now, taking the solids other than fat 8·55 and under as adulterated, we find that 84 samples would be returned in 1897, 88 in 1898, and 31 in 1899. I want to compare those figures with the proposition which has been made frequently, that the standard should be 12 per cent. of solids, containing not less than 3 per cent. of fat. If we see how that standard would work upon these figures, we find that in 1897, 119 samples would have been reported as adulterated, in 1898, 99 would have been, and in 1899, 37. If that standard is now compared with the results of my own standard, we shall find that in 1897, under the standard of 12 per cent. of solids containing not less than 3 per cent. of fat, 119 would be reported as adulterated, and by my standard 101; in 1898, 99 would be reported as adulterated, whereas I reported 93, and in 1899 there would be 37, and I reported 31. So that the standard of 12 per cent. of solids containing not less than 3 per cent. of fat practically amounts to slightly raising the standard which I have adopted—which would be adopted provided you fix limits similar to my old limits. It is exceptional for the fat to fall below 3 per cent. when the solids amount to 12 per cent. Only 12 samples out of 255, or 5 per cent. of the whole, would thus appear to be adulterated with skimmed milk; and this is only 1 per cent. of the milk supplied to the Metropolis, as judged by these figures. I think it only right to draw the attention of the Committee to that fact, because it is so frequently stated that separated milk is used, but these figures do not altogether bear out that assertion. I have no doubt it could be used; of course we know it could be used. These are a few of the conclusions that I think can be drawn from the consideration of this Table No. 7. In addition to this it is evident in times

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of drought, as in August and September, 1898, and in August, 1899, that the fixing of an arbitrary standard for solids other than fat, irrespective of the percentage of fat present, would lead to milk being condemned which might be, and probably was, genuine. In those three months of 1898 and 1899, 70 samples contained less than 8·55 of solids other than fat, while only 17 of those contained less than 12 per cent. of solids, and only 34 less than 12·25 of solids. The fixing of a standard of fat and total solids, assuming that we fixed 12 per cent. of total solids containing not less than 3 per cent. of fat, would have the following effect: First, it would slightly raise the quality of the milk as now supplied—that is to say, it would be a higher standard than has been taken by myself, and I am generally considered to take the highest standard; and it would prevent slightly abnormal milks, due to drought, being condemned, but it would be very difficult to maintain with the morning milk where the milking is uneven. That is, in my opinion, the great difficulty of taking the standard of 12 per cent. of solids containing not less than 3 per cent. of fat. Now to consider the effect of taking the two separately—the fat and the other solids. I want to impress particularly upon the Committee that if such a step is taken, two things must be done—not only must you fix the lowest limit which would be permissible, but you must fix a standard of normal milk on which you are going to prosecute when the milk falls below those lowest limits, because it would certainly be preposterous to take the lowest limit and to say that this is our standard; it would enable the vast majority of the milk—nearly all the milk produced in the country—to be adulterated. If we take the solids and the solids not fat separately and fix a standard for each of those, that standard is to be the minimum standard which is permissible, but is not to be the standard of normal milk. The standard of normal milk should, then, be fixed, in my opinion, quite irrespective of these limits, and if the milk fell below these lowest limits prosecution should be on the ground that it was milk of average composition which had been tampered with. For example: Assume that you fix, as I do, above 2·7 as the necessary limit for fat; if a sample of milk comes to me and shows 2·7 of fat, that being just below my limit (it must be above 2·7), I do not say that the milk is deficient in fat, but I assume that the milk was originally average quality milk containing at least 3 per cent. of fat, and I report that milk as having 10 per cent. of its fat removed. In the same way, if I receive a milk for analysis which contains 8·55 of solids other than fat, that being the limit when I begin to report, I report that as containing 5 per cent. of added water, because I maintain that the normal composition of the milk would have shown 9 per cent. of solids not fat. Now I am quite certain that magistrates have been prejudiced enormously by reports of milk that contained, say, 2·5 per cent. of added water. Naturally a magistrate, as a sensible man would ask, how can any analyst tell me that he can find 2·5 per cent. of added water in the milk? He knows that it is impossible. If a high standard—a comparatively high standard—is taken for normal milk, and if a milk falls below your lowest limit prosecution is taken on the higher standard, it would then be impossible for any analyst to prosecute for less than 5 per cent. of water or less than 10 per cent. of fat removed, and this would give sufficient range to cover, in my opinion, all of what I may call the justifiable fluctuations in normal milk. If, on the other hand, you say, This is our standard, and you take the limits as your standard, then you practically preclude a public analyst from prosecuting except on the ground that it falls below your standard, and I do not think fines would be sufficiently heavy simply on that ground to prohibit wilful adulteration, because the analyst would not be able to state that there was a fair proportion of added water unless the milk was so palpably and heavily adulterated as to actually deserve the most severe penalty.

6032. To summarise this, I should like to know what form the recommendation as to limits to the Board of Agriculture would take; what in your judgment would be the kind of regulation which the Board of Agriculture would have to make, assuming your suggestion were adopted?—I should recommend the Committee to adopt in this case some such standard as follows: "The average composition of milk of good quality shall be taken to be—I must, I think, leave the figures for the Committee—so much per cent. of fat and so much per cent. of solids not fat, and so much per cent. of total solids." My own opinion is that the lowest limit that you could take for these figures would be 3 per cent. of fat, 9 per cent. of solids not fat, and 12 per cent. of total solids. That would be what you fixed as your standard for average milk. I hope the day will come when that fat might be raised to 3·25. I do not think myself that it would be very difficult for the farmers of England to comply with—the best farmers of England, I am sure, could easily accept such a standard even now. Then, "owing to fluctuations due to causes not always under control, certain allowance has to be made for departure from this standard; hence milk shall be considered adulterated which does not contain more than 2·7 of fat or 8·55 per cent. of solids other than fat, and the proportion of adulteration shall be calculated on the assumption that it was, originally, average quality milk. Provided that where the total solids amount to 12·25 per cent. a milk shall not be deemed to be adulterated with water for deficiency of solids not fat unless the solids not fat fall below 8·1 per cent." I think that standard is a standard which would get rid of all the difficulties of ordinary milk producers, the variation in time of milking, the natural difficulty of the effect of drought, and, to a certain extent, the difficulty which sometimes arises from the influence of food, and yet it would be a fair check upon the wilful adulteration of milk.

6033. Now, let us just think how this would work out. This practically means in effect that no prosecution would be instituted on a milk, we will say, which had this composition—2·75 of fat, 8·55, we will say, of non-fatty solids?—Well, I should prosecute on the 8·55.

6034. Your limit is 8·55, is it not?—Yes, those are the limits on which I should begin prosecution.

6035. Tell us what you would do if you had a milk which gave you 2·75 per cent. of fat and 8·55 per cent. of non-fatty solids?—I should report it as containing 5 per cent. of added water.

6036. Why?—Because it has reached the commencing limit of what I consider adulterated milk.

6037. You base your conclusions that it contained 5 per cent. of added water upon what factor—the departure of 8·55 from your normal of 9?—Yes, and no counterbalancing fat to show that that departure was due to normal and natural conditions.

6038. I yet do not quite see therefore what the practical difference is of keeping your limits of 3 and 9 and starting a presumption on anything below that; I cannot quite follow what the practical difference is?—Because there is no doubt that a great quantity of milk which is natural genuine milk does fall below 3 per cent. of fat.

6039. A great quantity you say?—Yes, I believe a great quantity of milk as produced at present in the morning would fall below 3 per cent. These figures here show that a pretty considerable number fall below 3 per cent. of fat. In 1897 there were 69 samples; in 1898 there were 51; in 1899 there were 17. It is very difficult to say that those were all adulterated, especially as the great majority of them did not fall below 2·70, but contained more than 2·70 of fat.

6040. Then the upshot of what you have told us is this—that the allegation that the old Somerset House standard, if I may so call it, of 2·75 of fat and 8·5 of solids not fat permitted an enormous amount of adulteration is not necessarily borne out?—I think it is, because unfortunately, they took that as the standard of natural milk; they did not take the high standard of 12 of solids and 3 of fat and prosecute below those figures, but, so far as I can remember, they calculated the adulteration on the assumption that those figures represented the normal composition of milk. Now, if you take that as the normal composition of milk, imagine a milk which contains 5 per cent. of added water and what it comes to.

6041. May I point out to you that all that that affects is not the fact of adulteration; all that it affects is the extent?—It affects the check—that is my view—on adulteration; it was not a check on adulteration.

6042. I yet cannot quite understand; we will put another case?—I should like to work that one out completely. You have put this very typical case—2·75 of fat and 8·55 of other solids. As I say, I should report that as 5 per cent. added water. The old Somerset House standard would not have touched that—the so-called, we will say, Somerset House standard of 8·5. What I complain of is this—suppose a sample of milk contained 8·4 per cent. of solids other than fat, what is your public analyst going to report? On his old standard he took 8·5 as normal, and he reported that deficiency as 0·1. I ask that 9 should be taken as normal, and the 8·4 should be reported on the 9 standard, not on the 8·5 standard.

6043. I see exactly what you mean, namely, that the deficiency should be calculated upon what is a real standard?—Yes.

6044. We must draw a distinction between limits and standards?—Certainly.

6045. Your limit is 2·7 of fat and 8·55 of non-fat; your standard is 3 of fat and 9 of non-fat?—Yes.

6046. In your capacity as a public analyst, assuming you were one, you would initiate a prosecution on—at all events, you would report as adulterated—a sample of milk which contained 2·75 per cent. of fat and 8·55 per cent. of non-fat, and you would report it as adulterated with 5 per cent. of water?—Yes.

6047. You mean, in fact, that by the addition of 5 per cent. of water you would have lowered the proportion of the fat from 3 to 2·75, and the proportion of non-fatty solids from 9 to 8·55; is that it?—No, I should ignore the fat pro tem. in a case like this; the fat, not having fallen below the standard, would be ignored, and the prosecution would be based upon the fact that the other solids are below the limits—I will use your word; the fat not having fallen below the limits, no prosecution would take place on that ground; but the other solids, having fallen below the limits, the prosecution would be on that ground for added water, which would be calculated on the 9 per cent. standard.

6048. Now, we will put another case which might well occur: Supposing you had fat 2·75 per cent., solids not fat 8·8, we will say—what would you do?—I would simply report that as milk of poor quality. It would fall below the standard, but not below the limits; hence you are bound to report that as milk of poor quality, and if you report milk of poor quality, men will not buy it—will not pay a farmer for it.

6049. We are talking of police cases?—I quite agree with that, but I mean to say that this sort of milk will get knocked out of the market—you do not get these qualities. That is what I have tried to show the Committee—that you do not get these kinds of milk. Add those two figures together; what do you get? 11·55 of total solids.

6050. Do you mean to say that this is an abnormal ratio between the fat and the non-fatty solids—2·75 and 8·80?—Yes.

6051. Such a thing never obtains?—It is a sort of milk that does not appear, or which appears very seldom. If you take my figures you will find that there are 34 such samples out of 916. The proportion is a mere nothing—3 or 4 per cent.

6052. What I wish to be clear in my mind is, by fixing what at first sight seems a relatively low proportion of fat and a not high ratio of non-fatty solids you do not allow of the addition of a considerable quantity of separated milk. I cannot help seeing that your non-fatty solids are normal, or substantially normal, and that the deficiency is in fat. It seems to me that that obviously indicates admixture with separated milk; does it not?—No.

6053. How?—If a normal milk were brought down to 2·75 with separated milk, the solids not fat would be over 9, and to bring it down to this 8·80 you would have to put water in as well.

6054. Supposing it did bring the solids not fat over 9, the fat being as low as 2·75, what would you do then?—There again you have got 9 and 2·75; you simply report, "This milk is deficient in fat"; but, you see, you have taken a case which is just above your limit.

6055. Of course, it is a case which may well occur?—It is a case which might well occur, but it is very evident that there could not be 10 per cent. of separated milk more in this milk than could be present if you fix your standard as 3 per cent. of fat.

6056. I do not express any opinion just now without calculations about the exact amount, but it obviously allows the addition of a certain amount, be it big or be it little, of separated milk?—Undoubtedly; and any standard which you can fix is bound to allow it, as I stated to begin with. It is absolutely impossible to fix a standard which shall altogether prohibit the use of separated milk and water to a certain extent—it is hopeless. Take, for instance, milk which is supplied to the British Dairy Institute. I happened to be at a meeting yesterday, and we had the figures of the average composition of the milk which is supplied by a farmer close by to that institute—3·4 per cent. of fat in the morning and 4·4 per cent. of fat in the evening. Even assuming that you took 3 per cent. of fat as your standard, that would allow 15 per cent. of separated milk to be added to that evening's milk, and still to pass the standard of 3 per cent. of fat.

6057. I quite admit that when we are face to face with this great discrepancy, or relatively high discrepancy, between the morning and evening milk, due to the unequal times of milking, and when we have to fix our standard with regard to the possibility that we are examining morning milk, we may always be open to the possibility of a large admixture of separated milk with evening milk—I quite think that, and I do not see exactly how we are going to get over that?—No, quite so.

6058. But certainly I may say that this seems to me rather a retrograde step to ask us in effect not to begin anything in the nature of a prosecution with a limit of fat so low as 2·75. I fail yet to see that it would not allow a large quantity of separated milk being added to the whole milk supply of the country, morning and evening?—I quite agree with you—morning? Well, yes.

6059. It is bound to, on your own figures, in the morning, too?—Yes, the morning to a certain extent—morning and evening undoubtedly. I do not ask you to fix that standard, but I put before you the effect of the two standards. I have tried to put before you the two standards, and the fair way of treating either and the effect of either.

6060. When you took the effect of the 3 per cent. and the 9 per cent. I was with you, but when you finally come down to 2·75 and practically say, "No, you must not start doing anything until you have got over that limit of 2·75, and you may calculate the deficiency with reference to an ideal standard which you set up of 9 for the purposes of calculation—that is a mere question of extent and degree, but you do not touch the fact?—Still, you could not possibly fix a standard of 9 per cent. of solids not fat by itself.

6061. You mean to say independent of the fat?—Yes.

6062. I do not suppose anybody thinks of that, but it seems to me a very intelligible position to think of a composition of 12 per cent. of total solids of which 3 at least shall be fat?—As I say, it has certain very good points, but still it would leave you to fix a limit to prevent adulteration then.

6063. I think not; I venture to think that is rather contemplated by the Act. I think Section 4 really had that thing in view. What we are asked to do practically in effect by Section 4—you are familiar with the Act, are you not?—Yes, fairly well.

6064. Section 4 practically implies that the Board of Agriculture shall fix certain limits at which a presumption shall be raised that the thing is not right. That leaves to the person incriminated the onus of clearing himself from the imputation, and we as a Committee have been asked simply to fix practicable workable limits as to when this presumption should be raised. We do not want to put a man in an unfair position; we do not want to haul him into the police-court harshly; but we are asked in effect, Having regard to the normal milk supply—I mean, having regard to all the conditions under which genuine, good, honest milk is supplied—what would be fair workable limits to regulate public analysts as to when a presumption shall be raised? It is for the man in the exceptional position to clear himself from the imputation of dealing with a fluid which is below any reasonable standard of quality?—I know; unfortunately it is the wording of the Act, and I regret it. I tried hard to prevent it. According to my reading of the Act, if the man can prove that the milk is as it came from his cows, he goes scot-free; but I have tried to show the Committee that it is possible to have cows which give milk which is not fit to be sold as an article of food.

6065. That is quite possible. No doubt that may occur now and again; but do you not think that the natural effect of the working of that section will be that a man will seek to set aside the conditions which bring him into the police-court?—Yes, I do.

6066. Therefore, that we shall get what we seek, although, perhaps, in an indirect way?—I hope so undoubtedly.

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6067. Then what is your ethical objection to the section?—Because it permits of something which I do not think should have been permitted. And for another reason, too—it still causes the man to be prosecuted for fraud. I do not think myself that the Act has altered the old Act; I think that he is still prosecuted for fraud. I asked particularly of the Committee that a standard should be fixed, and that the man should be prosecuted for selling milk below the standard. If Parliament had thought fit to adopt that, then I would have said, fix a high standard as the man has not much to suffer; but now as they did not do that, the man is prosecuted for fraud. It is a very serious matter to prosecute a farmer for fraud unless there has actually been fraud. That is why I feel compelled to impress upon the Committee what perhaps are lower limits than I could wish, but I think one is forced into it. You cannot prosecute a man for fraud unless you give him a fair loophole of escape, where there has not been fraud.

6068. So he has; he has every loophole that it is possible to afford him, surely?—I do not think so.

6069. Why? Has he not the appeal to the cow; he can bring any number of witnesses that he likes to show that nothing has been done with the milk; he can prove that it has not been tampered with all along the line?—It is very difficult to do—exceedingly difficult to do; and very often the public analyst is not very rapid in his analysis and report, and his committee do not take up the prosecution very soon, so that some weeks may elapse before the farmer is made cognisant of the fact that he is going to be prosecuted for selling the milk. After that interval of time the cows may be producing a very different quality of milk. You say he can appeal to the cow, but how is he to do it a month afterwards?

6070. I know very well about the difficulties; I daresay in some cases the man would suffer hardship; but then I venture to think that if anybody is to suffer hardship, rather the farmer than the whole community; on the principle of the greatest happiness to the greatest number, surely it is much more desirable that the man who vends an article should suffer than we who have to pay a fair market price for it?—Yes, of course, we agree on that point. I have made it clear that I hold that view.

6071. Anyhow, the point really is this—we have got to deal with an Act of Parliament as it is; whatever be the abstract objections to it, we have got to deal with the thing before us?—Yes. Those are the two methods, in my opinion, in which it may be dealt with. You may fix total solids of 12 with a fat percentage of 3. The Committee may not perhaps be aware that so far back as January, 1895, I gave a lecture to the Metropolitan Dairymen's Society on a standard for milk. Unfortunately, the reproduction of the lecture seems to have been completely sold out and got rid of. I there went into all the figures, and said "Now, I would suggest that the standard should be 12 per cent. of solids containing not less than 3 per cent. of fat." Those were my words in 1895 to the Metropolitan Dairymen's Society. I may say that I have advised dairymen to use that standard for years, and I would bring before your notice in a moment the effect. Then, having discussed all the points, I further said, "Some have advocated a higher standard, but I venture to think that this cannot be maintained at all periods of the year and in different seasons without considerable difficulty on the part of the producer. Others consider that a standard of 2·75 of fat and 8·5 of other solids would be sufficient for all practical purposes. I cannot agree with them. It would simply leave matters much as they are at present and open the way for considerable and certainly profitable adulteration." So that for many years past I have felt that if we want to improve we may take that standard. But I still think that for practical working purposes it is most essential we should have lowest limits, because there is no doubt about it that an evening milk may be very considerably tampered with and yet pass your standard of 12 per cent. of solids containing not less than 3 per cent. of fat, and may even show conclusively by the solids not fat that it contained added water; and unless you provide for such a case you would not be able to prosecute. So that both methods have certain advantages.

6072. I think we are already sufficiently seized of the difficulties. We know, of course, generally what they are. It is practically a choice of evils?—Yes.

6073. The point we have got to determine is which of those particular methods we have got to recommend?—Yes, quite so.

6074. I should like, in the shortest possible terms, to get from you which you would advise us to recommend?—Taking into consideration what I know to be the difficulties which certain farmers have to contend against, I think that if you fix a high average composition and fairly low limits in all probability you would cause less injustice than by fixing total solids and a certain standard of fat.

6075. What should you prefer to recommend as the limits?—I should recommend that prosecution take place if the fat fell below 2·71—that gets exactly clear of our 2·70—and if the solids not fat fell below 8·56. The prosecutions, of course, would take place on the higher standard. Now, can one judge the effect of fixing a standard? Is it feasible to fix a standard of 12 per cent. of solids containing not less than 3 per cent. of fat? This standard has been adopted by Messrs. Tunks and Tisdall for many years past, and in Table No. 8 (*Appendix* XVIII.), you will find the average composition of the morning milk which has been supplied to them since 1887 up to 1889 on contracts containing that standard. Those figures are certainly conclusive evidence. You have got no less than seven herds here, and you will find that in no single instance, taking the average of the years, has it been at all difficult to meet that standard.

6076. It is quite true there is no case for twelve years where the amount of fat is below 3·23, and there is only one instance in which it is 3·23; but the great majority of them approximate between 3·4 and 3·6?—Yes. Those are averages taken from individual analyses, and I have put as a footnote, "Of about 600 analyses, which these figures represent, the fat fell below 3·25 per cent. in 87 cases, or nearly 15 per cent." There I refer to individual samples taken separately. Samples were taken every month, and sometimes twice in the month.

6077. Perhaps you are not able to tell us how many of those fell as low as 3 per cent.; those which fell below 3·25 are only 15 per cent. of the number—how many of those would fall below 3 per cent.?—It would be exceptionally rare, and of course there would be immediately a protest.

6078. If large traders such as those are and other traders such as you have business relations with have very little difficulty in getting milk beyond the limit of 3 per cent. of fat all the year round, why should the consumer be in a different position from the vendor—why should he not actually expect to have at least 3 per cent. of fat?—I think he ought to.

6079. You do not give him much help to secure it?—I think so.

6080. How? You say that nothing shall be done to the vendor if the fat is not above 2·75?—I certainly have not made my meaning clear, because I do not think that, as a rule, you get adulteration which would escape notice.

6081. Pardon me, the most insidious fraud with which we have to contend with is the addition of separated milk?—Yes.

6082. That is the most frequent and the most insidious?—The most insidious. Yes. As to the most frequent I cannot say.

6083. There can be no question, I think, that if nothing is to be done unless a low limit of 2·75 is reached, there does appear the opportunity for a considerable admixture of separated milk to the whole general milk supply of fresh milk in this country?—Yes.

6084. There is another point, I think, which we cannot overlook; the analyses for the Metropolitan Dairymen's Society, I suppose, in many cases are the results of contracts made with farmers?—Yes, I should think so.

6085. And where a certain standard of fat is aimed at?—Yes.

6086. And where nothing would be said in those cases if a certain amount of separated milk had been added provided the standard of fat was maintained?—No.

6087. Therefore you may start, for all we know, with a considerable number of samples which have already, from that point of view, been tampered with?—Undoubtedly.

6088. And yet you ask us, on the basis of samples of that character, to still further lower the standard?—No, I am asking you to raise the standard—I am not asking you to lower the standard; I am asking you, most distinctly, whatever you do, even if you keep your limits low, that the standard shall be raised.

6089. I beg your pardon, you are quite right; I made the usual confusion between limits and standards; you ask us, at all events, to do nothing unless a limit lower than 2·7 is reached?—Well, you may put it so; but I do not ask you; I come here with no object to ask one thing or the other. I felt it was simply my duty to lay before you all the facts of which I am cognisant, and I think that really the question of fixing a standard is a subject for you to decide. I have tried to put before you arguments which can be used on either side—for and against—and the effect. I have read also a distinct statement in print in my own words in January, 1895, where I recommended 12 per cent. of solids with not less than 3 per cent. of fat—so you cannot say I recommend something else now.

6090. I did not gather that you still adhered to what you said in 1895?—I certainly think, if you are going to fix the solids and the fat as your standard, that is your standard; I say if you are going to separate them and fix the fat separately and the other solids separately, then it is necessary to take low figures; that is what I want to try to impress on you.

6091. Have you anything more to say on the general question of the standards?—With regard to milk I think I have said all that practically I can say.

6092. Will you tell us, then, briefly what you have to say with respect to condensed milk and to cream?—With regard to condensed milk. It is usual for condensed milk as sold to the public to bear a label stating the proportion of water which may be added, and it is therefore only necessary to stipulate that when so diluted it shall produce a liquid containing not less than the percentage of constituents which shall have been fixed as the minimum standard of milk. But condensed milk might be sold not so labelled, and, of course, it would open the door and invite people who wanted to sell condensed milk fraudulently not to label it after that standard had been fixed. So that I think where condensed milk was sold without such a label you must fix a standard of some kind. In my opinion this should be that it contain not less than 12 per cent. of fat—that is to say, one part of condensed milk can be added to three of water and make four parts of milk; I believe that is about the average proportion of dilution requisite.

6093. We are, of course, met with the difficulty, as regards condensed milk, that some considerable portion is sweetened?—Yes.

6094. Of course a considerable portion also is not sweetened?—Yes.

6095. Now the sweetened variety requires the addition of a very much larger quantity of water, in some cases at all events, to do anything with it at all—to make it practicable to use it?—Yes.

6096. In that case how would your label read?—Simply put the quantity of water that is necessary to make it milk of your standard as regards fat.

6097. But then it would still be unusable—it would be so thick or viscid that you could not use it?—I am not sure but the sooner that sort of milk is prevented from being sold the better.

6098. Of course, it is a commercial article; there is nothing to prevent it?—Yes, but I think you must be well aware that poor people know nothing whatever about this condensed milk; they think that the solidity is due to the constituents which they would get in the milk.

6099. Yes, I am aware of that; we have had it in evidence that a considerable quantity of this stuff is used by mothers as food for their infants; they take it partly because it is sweet—that makes the stuff palatable to the child; but they have to dilute it with such a large volume of water to put it into the feeding bottle or to do anything with it, that practically the child is fed upon a starvation diet, the only nutrient thing being substantially the sugar. What could you do with such a case as that—how would your label affect that case?—It would prohibit the production of such stuff, would it not?

6100. We have no power to prohibit the production of it?—I do not know; you can say condensed milk is condensed milk, and if, when a certain amount of water is added to it it does not make milk but makes something else, it has no right to be called condensed milk. In my opinion there is a great deal more trouble in the country due to the consumption of condensed milk than people have ever found out. I do not think the medical profession have thoroughly appreciated the very great amount of illness, which may be caused by the foolish consumption of condensed milk.

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6101. Have you made many analyses of condensed milk?—Yes, a pretty good number.

6102. Of typical brands?—Yes.

6103. Good brands?—Different brands.

6104. Do you find that they contain as much as 12 per cent. of fat?—The best do undoubtedly, and they go down to 2 or 3.

6105. Are you not pitching the limit rather high when you say 12 per cent.?—I said that that should be in respect of a tin which does not bear a label stating what quantity of water is to be added.

6106. But you also stated that the limit of fat (if I heard your answer correctly) in condensed milk should be 12?—No.

6107. I am misinterpreting you then?—Certainly. Only where the tin does not bear a label stating to what extent it might be diluted—where there may be an attempt at fraud. I was thinking really of the victualling of ships, where there is no label on the tin, but where milk is sent in in simple plain tins with nothing on them. How are you to prevent a man who is victualling a ship with condensed milk from having fraudulent stuff sold to him? At present they come to analysts like myself, and they buy on the strength of the analysis.

6108. Is it not always open to them to do that?—It is, but the moment you fix a standard it is also open to the man who would fraudulently sell condensed milk to do so in a tin without a statement of the quantity of water which may be added, unless you compel them to state it on the label when sold for the public. I do not know whether I make myself clear.

6109. Yes, I quite follow you and understand; what more have you to tell us about condensed milk?—I think that is practically all.

6110. Now, as to cream?—With regard to cream, here I think there must be a distinction between cream sold in pots or potted cream and cream sold, as it is at times, for butter production. For instance, I have known a dairy school held where they required more cream than they could easily obtain, and it has been sent from a creamery. Supposing the inspector took a sample of that cream *en route*, it would never do for it to have a standard such as would be required for potted cream, because if so it would be spoilt for churning.

6111. Does that consideration really enter into the question—that is a transaction between a butter-maker and a cream producer, is it not?—Yes, but he is selling cream.

6112. To whom—to the producer of butter?—Yes, it might be a dairy school or it might have to go by rail.

6113. He is exactly in the same position, is he not, as the milk purchasers for whom you act and the farmer. We do not wish to interfere between the milk purchaser and the farmer as to the quality which they shall respectively serve one another with—that is a matter entirely for themselves?—No, not in the case of milk.

6114. Until it becomes an article of common consumption and is vended for sale; up to the point that it leaves the milk vendor's premises it seems to me that we have nothing to do with the transaction as between the producer of the milk and the approximate vendor of it; he can look after himself, as he does, in fact, by your analysis?—Yes, but I think that such things as railway samples are taken, and can be taken by inspectors under the Sale of Food and Drugs Act, that is, a sample of the milk really as it is passing between the farmer—the producer—and the purchaser.

6115. Stop a minute—let me make it quite clear; it seems to me that nobody has anything to do with the farmer and the middleman, the middleman looks after himself by the system of check and analysis which he employs; he safeguards his own interests in the mode you have shown us, so what we have to do is to protect the interests of the consumer. There is no association whatever to protect him—there is no machinery enabling the public analyst to protect him, and what we are doing is to determine limits upon which the public analyst shall initiate a prosecution?—Yes.

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6116. Up to that point the whole thing takes care of itself; we can safely leave the great milk vendors to see that they get value for their money; therefore, it seems to me that this is precisely an analogous case as between your cream producer and your butter merchant—it does not seem to me that we need fix a standard for those people?—Unfortunately, not being a public analyst, I am not up in the legal aspect of this, but I was under the impression that a sample can be taken *en route*, that is, between the producer and the middleman, and submitted to the public analyst.

6117. But who is to initiate a prosecution in that case; who is the man aggrieved?—The vendor. He has been aggrieved because he is receiving an adulterated sample and he is being prosecuted for selling it. He has sold it as he received it, and he cannot go further back.

6118. If he has a contract for the supply of a certain article he has a remedy at common law. He does not bring his action under the Food and Drugs Act; he has a remedy for breach of contract?—As a matter of fact, I think they do bring it under the Act, but I must ask you to refer that question to a public analyst.

6118*. The point I want to get at is—does it seem a reasonable thing to ask us to apply a standard or to suggest limits where the transaction is between a farmer and a butter producer?—Certainly not. I want distinctly to point out simply that when you have fixed your standard it must be understood not to apply in such an instance.

6119. As a practical matter it would be understood?—Well, I don't know. I find separated cream, taking the last fifty samples which I have analysed, varies from 10·16 per cent. of fat to 57·97, and the majority contain from 20 to 35 per cent. of fat. In potted cream the lowest percentage of fat was 20·42—the highest 75·55, and the majority contained from 45 to 60 per cent. The British Dairy Farmers' Association, for the Dairy Show, acting on my advice, fixed 40 per cent. of fat as the minimum allowable in potted cream.

6120. Has that proved itself to be a fair and workable suggestion?—Very rarely is the sample below. It ranged above that up to 75; Devonshire cream sometimes will reach 75 per cent. of fat.

6121. Of course, those are all creams obtained by the action of a separator?—No, certainly not.

6122. Are they hand-skimmed?—They may be obtained anyhow for the Dairy Show; they may be hand-skimmed, they may be scalded, which would be skimmed from a pan after scalding; the thickest cream which is manufactured probably is the scalded cream of Devonshire and Cornwall.

6123. Is the actual amount of fat so much under control, then, that in hand-skimming or in any other way you can be certain of reaching this limit of 40 per cent.?—I think it can be done, certainly. Every separating machine has a means of regulating that.

6124. Yes, I know that, and if it was separated by the action of a separator it might quite well be achieved, but in the other methods you are speaking of is it to be easily achieved?—Naturally, more easily.

6125. By other methods than by the separator?—Yes, because I do not think you will get any keeping cream except it is separated or scalded; I do not think it would be possible to pot down cream which had been raised on an ordinary shallow pan and hand-skimmed.

6126. The hand-skimmed then practically eliminates itself?—I think so.

6127. Have you anything more to say in respect of cream?—No, I think that is practically all I can suggest with regard to cream.

6128. (*Major Craigie.*) Turning to the answer you gave on the subject of the effect of feeding on milk, as arising only one month after the date of the change of food, did I rightly understand that that was your experience?—In that particular herd it was one month after the farmer first consulted me before the milk was passed as coming up to the standard required.

6129. Speaking generally, you have given a great deal of attention to this question of the effect of feeding upon milk?—Yes.

6130. Are your conclusions in harmony with that—that no immediate effect is produced by a change of food?—No, I cannot say always no immediate effect is produced; it very much depends on the condition of the animals.

6131. We have had that also in evidence from another source; but you are really of opinion that on the whole the question of feeding does materially enter into the matter as affecting the quality of the milk?—Yes, I believe it be one of the controllable conditions which affect the quality.

6132. I daresay you have seen the experiments published, I think, some of them, in the Highland Society's transactions, others in the Education Report of the Board of Agriculture, as conducted by Mr. John Speir, who gave evidence here on that very point of feeding?—Yes.

6133. In those experiments he summed up his conclusion that the result of improving the feeding was to increase the quality of the milk between the tenth and twentieth day, but after that it gradually descended to between the fifth and sixth weeks from the time of changing the food, and from and after that date no perceptible effect or a very slight effect only was seen in the milk. That is the general conclusion that he gave to us the other day. That is not in harmony with your experience?—I have not carried out experiments continuously on food like that. You see one of the great difficulties is that a change of food always has an effect on the cow, and then that change is lost if you continue your experiments too long.

6134. (*Dr. Voelcker.*) Taking Table 6, in 1897, is it the case that one out of every four samples was adulterated?—Yes. (*See Appendix* XVI.)

6135. Where did those samples come to you from—were they as they came from farmers to the metropolitan dairymen or as the metropolitan dairymen were going to send them out, or might they have been one or the other?—They might have been either one or the other. They would be sometimes samples as they came from the farms—to check them; sometimes samples as brought back by their own man—to check the man.

6136. You could not discriminate?—No.

6137. Then in 1898 practically one out of every four were adulterated again?—One out of five, at any rate.

6138. This is an enormous proportion surely?—Yes, undoubtedly it is.

6139. Can you account for it in any way, because in 1899 it is only one out of 100?—No, one out of ten; there were 313 samples and 31 were adulterated; it was an exceptional year.

6140. (*Major Craigie.*) But the totals were quite different in the year 1899 compared with what they were in the two previous years; there was a material reduction, and you only examined in 1899 three-fourths of the total number examined in 1898 and 1897?—Yes.

6141. Might it not be possible that some particular source of supply was eliminated in 1899 which might effect the great difference in the percentage—that has occurred to me?—It might be, but I cannot say. I do not know whether there would be any reason for that; I think it was a general falling off. It is very curious how these samples fluctuate from year to year, and from month to month.

6142. It might be, might it not, an explanation that there was a very different percentage of adulteration cases in 1899 from what there was in either of the two previous years?—I do not think so. I think really if you take 1898 the very large number was due to the effect of the drought which caused such a terrible fright among the purchasers that I had 133 samples during those two droughty months.

6143. (*Dr. Voelcker.*) There was a drought in 1897, and something like one out of every four samples was an adulterated sample?—Then I may go back to these figures, given in my evidence on 11th March, 1896. There I found 24 per cent. adulterated; that is one in four up to 1896.

6144. On the general point it does not show a satisfactory state of things as regards the supply of milk to the public in London?—Certainly not.

6145. What have you reported as adulteration is what falls below the standard you then took of 2·7 of fat and 8·55 of solids not fat?—It fell down to that—I will not say below.

6146. It came down to 2·7?—Yes; the 2·70 of fat was below my limit, and so was 8·55 of other solids.

6147. Taking the year 1897, is there any reason which presents itself to you why the largest number of adulterations were in November?—If I remember rightly that was the year when there was a very short supply of milk; when there was a great falling off in the quantity of milk; but I will see if I can prove that.

6148. I will not trouble you; it is not so very material. What I wanted to get from you is that November is not a time of the year when you would naturally expect a poor quality of milk?—No, I think there was a very short supply, and that would cause a great tendency to adulterate.

6149. That is what I wanted to get at?—That is a matter of fact that where there is a short supply there is an increase of adulteration.

6150. There may have been a shortness of supply and a tendency to adulteration there; would not those same causes act also in August and September of 1898 and 1899? You have noted the drought in 1898 especially, but might it not be the case that, owing to the drought of 1898 and the dry time also of 1899, there was a shortness of supply and a great tendency to adulterate with water?—Of course, it might be so, but I think it was fairly well known, and is known that this droughty season produces milk of abnormal quality to begin with, and therefore that it is almost impossible to adulterate it.

6151. Yes, but I think that we have had it—and I think we had it from you, too—that the abnormalities do not consist in a low percentage of fat?—No; but then you see what I want to impress upon you is that already the milk as it comes from the cow might be condemned as having 10 per cent. of added water.

6152. Owing to the cow having drunk so much water?—Yes, partly to that you may say; and then a man would be more afraid than ever to add water to that milk.

6153. You could not pick out from this number of adulterated samples in August and September, 1898, those which showed signs of adulteration with water? You have mentioned cases where the fat is high in them, and the total solids may be high, but you have still reported a considerable number as adulterated, and have shown that they indicate the difficulty of fixing a standard?—Yes.

6154. Could you tell if many of these show the presence of extra water?—I think that is answered by the figures. Turn to Table No. 7, and take August and September, you will find that there is not a single sample under 2·7 of fat, and not one under 3 per cent. of fat in August, 1898—that is one of your months—and only six under 3 per cent. of fat in September, 1898.

6155. That would not exclude the addition of separated milk, would it?—No, but they were reported as adulterated not because of the fat being low but because of the other solids being low; it was because 41 of them came under the 8·56 of solids not fat.

6156. According to Table No. 6, of the 19 adulterated in August, 1899, 11 had 12 per cent. of solids or over; that leaves only 8 under?—Yes.

6157. I put it to you, is it not quite possible that many of these were abnormal, and that they had separated milk added to them?—No, certainly not.

6158. What leads you to think that?—Because they were all condemned owing to the fact that the casein, etc., the solids not fat, was under 8·56.

6159. They were condemned on the solids not fat?—Yes, all of them; so you see that they could not have contained separated milk.

6160. Then the solids not fat being low might be also caused by the addition of water?—Yes, it might have been that they were watered, but I think the high percentage of fat precludes that possibility.

6161. A droughty season coming makes the milk extra rich in fats, and that, coupled with the addition of water to make up the quantity, would account for such figures as you have got?—Yes.

6162. Now, take Table 8, in regard to 87 cases there where the fat fell below 3·25, you have nothing to say whether those were genuine or not?—No, nothing.

6163. You mentioned the case of a farmer who has abnormal cows, and you said that that might be very well dismissed from our consideration; I take it you mean that the difficulty levels itself with a large number?—Yes, because such cows should not influence a standard.

6164. But still it does not meet the question of what is called the small man who keeps two cows. Now the bent of your remarks was rather to make us think that the future of dairying would lie in the hands of big men?—I did not intend that. I wanted to maintain the supposition that if a man has a few cows it is his duty to see that those cows do give good milk.

6165. But think of the difficulties of the small man who only has two cows, knowing, as you do, how the quality of the milk alters immediately after calving; his circumstances are very different if he is to be prevented from sending milk into a town; whereas in a big dairy, the cows being made to calve at intervals spread over the year, those difficulties with regard to the quality of the milk do not arise?—They do not arise in the big dairy to such an extent, but the small man has a simple means of overcoming it by calving those two cows at six months' intervals; then he can overcome the difficulty.

6166. You do not think it is too much to ask him to look after that?—No.

6167. Do you not think it is rather much to ask the small farmer to test his cows, and see whether they have tuberculosis or not?—We will leave tuberculosis out. I do not think it is too much that he should know what he is producing; it is so very cheap.

6168. Was your extreme limit put out at all with the view of meeting the case of the man who keeps a few cows?—No.

6169. Was it in consideration of the big dairyman?—It was in consideration of the big dairymen near a town who have to milk at uneven intervals, which is, in my opinion, the greatest practical difficulty that we have to overcome.

6170. If he does give uneven milk you think he ought to alter his times?—They must settle it, and they will do, after you have settled the standard.

6171. According to your experience is there much adulteration done by the farmer?—They do not let me see what they are doing.

6172. But you have had a large number of samples from farmers direct?—No, I cannot say that I have, direct from the farmers.

6173. Not from the farmers themselves, sent to you?—No; I have had a certain number.

6174. The business clients of yours may have sent to you samples that they have received from the farmer?—Yes. They say, of course, they have come direct from the farmer, but what I mean is I have no evidence to prove that they have come direct from the farmer.

6175. So that really you cannot tell us from your own experience whether adulteration, when it does take place, is carried out more by the farmer or by the vendor of milk?—No, I cannot say.

6176. Do you think there is much adulteration or taking of milk on the railways?—I have not been able to prove it.

6177. You have suspicions about it?—Yes.

6178. You are, I may say, in the happy position of not being a public analyst, I believe?—Yes.

6179. I suppose a number of the things that you have told us here to-day would not have been put in quite the same way had you been a public analyst?—In what respect—mention one?

6180. I mean, for instance, you would not have felt yourself so free to express the way in which you would give your certificate as to certifying whether there was 5 per cent. of added water or whether a certain percentage of fat had been removed?—Yes, I should. I think that is what the public analyst ought to do. Moreover you give me an opportunity of saying once more what I want to say every time I have the opportunity. In my opinion the public analyst ought to state the figures which he obtains as the result of his analysis before he states the opinion which he forms on those figures. I should have no hesitation whatever if I were a public analyst in giving my figures, and stating definitely that a certain milk contains 5 per cent. of added water.

6181. Do you think that an analyst is able definitely to say upon certain figures which he obtains in an analysis that a certain amount of water has been added, or that a certain amount of fat has been removed, or that a certain amount of separated milk has been added?—Certainly, or else he cannot say it at all.

6182. Do you mean to tell me that an analyst can dis-

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criminate between the removal of fat and the addition of separated milk?—No; but it is practically the same.

6183. But you would not, in your present position, hesitate to say which you thought was the case—I am putting to you the difficulties of the relative positions?—I do not think the position would affect it. If in a sample of milk deficient in fat the solids not fat were practically 9 per cent. I should say the milk had probably been skimmed, but, if the solids not fat had risen at the same time as the fat had decreased, I should say the probability is that skimmed milk had been added. But in either case I should say what my report always says:—"This milk has had a certain proportion of fat removed," but I do not say how it has been removed.

6184. What I wish you to recognise, if you will do so, is that the position of the public analyst when he gives a certificate, and that certificate is put into court, is very different to your position, when you are dealing with private clients to whom you give advice which does not come into a public court. If, for instance, an analyst certifies that there is so much separated milk added, and it came out in the course of the hearing that the man never had a separator, and that he had never had separated milk, but that what he had done was to remove some of the fat, the analyst would be looked upon with a certain amount of contempt for having made a wrong statement?—Yes.

6185. It would be held to be very much against him?—Certainly.

6186. If, on the other hand, he said that the milk had been skimmed, and the man had not skimmed it, but had added separated milk, there would not be much thought of the analyst then. In your position it would not matter, but I think you would allow that to the public analyst it does make a very great difference?—No, because I should not adopt either plan. I should simply state that a certain proportion of the fat had been removed, and that is all that the public analyst need state. He need not state how it has been removed; in fact, unless he can prove how it has been removed he has no right to do so, one way or the other. I may say that I think my analyses go into court quite as often as public analysts do, as far as I can judge. I have always the advantage over the public analyst that I state my figures as well as my opinion, and several magistrates have told me that they attach more weight to it when they have those figures, and can judge for themselves, than they do to the public analyst's opinion—this sample contains so much water.

6187. You must know that it is incumbent upon the public analyst to give the figures—he is obliged to give the figures?—They do not.

6188. It has been decided in cases before the courts that they must give them, and they always do now. Dealing with the figures which have been suggested for solids not fat, you would never think of taking that by itself?—That is the standard; I should not take that as the limit.

6189. Without reference to the fat as well?—No.

6190. If you had a milk with 3 per cent of fat and 9 per cent. of solids not fat, giving total solids of 12 per cent., is it not very likely that that milk has been adulterated?—It may have been.

6191. Is there not a probability that it has been?—No, you cannot say that there is a probability, because there is an equal probability of its not having been.

6192. I will put it to you: If the milk gives over 12 per cent. of solids, is it likely to have just 3 per cent. of fat, and be a genuine sample?—No, not if it has over 12. But you said 12 and 3; if it had over 12 per cent. of solids and only 3 of fat, then I should say there was a possibility of its containing separated milk.

6193. But you agree that if the milk gave over 12 per cent. of solids it ought to show more than 3 per cent of fat?—Yes.

6194. Would you consider that a wise provision to add to the general recommendation that you made before?—I do not see how it will affect a standard, unless a standard be above that.

6195. We have had it in evidence abundantly that separated milk is used for the purposes of adulteration, and the effect of the addition of separated milk is that you would get your solids higher, would you not?—Yes.

6196. And if you had a rich milk, say, a milk with 4 per cent. of fat, and you added separated milk to it, you might get only 3 per cent. of fat, and just over 12 per cent. of solids?—Yes, you could do that, it is possible.

6197. A standard, or limit, I will say, of 12 and 3 would not include that?—It would pass that.

6198. It would pass that, and yet there might be a quantity of separated milk?—Yes.

6199. You would agree with me, if you added a proviso that if the total solids be over 12, the fat must be at least 3·25?—No. They might be 12·1, to take a simple illustration. I do not think that would be fair; you might have 3·1 of fat and 9 per cent. of solids not fat; the solids are over 12, and yet the fat is under 3·25. The man would be prosecuted for selling a milk like that, and certainly that is quite a possible milk.

6200. You think 3·1 and 9 is a possible milk?—Yes, I think so. Turn to my Somerset results for 1892—May. We get a case there where the solids are over 12 in May, 12·04, and the fat is 3·12. Take it in June; the solids are 12·20, and the fat is 3·17. Take it in July; the solids are 12·20, and the fat 3·21. The farmers would have been prosecuted for those three months for producing milk under your standard of over 12 per cent., which must contain 3·25 per cent. of fat.

6201. That is in 1892?—Yes.

6202. Do you remember by what method you did those analyses in 1892, because that is some years ago?—All the analyses were done in the same way, by the estimation of the solids and calculation of fat.

6203. I do not see like figures in the later years?—It is the same in 1893. In 1895 and 1896 we were in districts with conditions which produced exceptionally good milk, and of a more uniform quality. You will find that in 1896 and 1897 there were cows calving down all through the season I think—or in 1897 there were. In 1892 and 1893 they were typical farms with very large herds; one was in the Cheddar district at Axbridge. In 1893 it was at Butleigh, near Glastonbury, both of them, in districts celebrated for pastures.

6204. I take that one case (Table I.); where you give the composition of genuine milk I do not see any instance where the fat falls below 3·25 when the solids are 12?—But that is average mixed milk of all the country.

6205. That is 1897, 1898, and 1899, and the same thing applies in 1895, 1896, and 1897 on table No. 2; the exceptions to my suggestions are based altogether upon two years which are exceptional?—Yes, they differ from the others, but still I think it only right to point out that there is this difference.

6206. You do not see your way quite to accept my suggestion?—No, I do not.

6207. Though probably 90 per cent. of the cases would be met?—I think in a great many cases it would be true.

6208. You cannot point me to cases of your own since 1895 in which it has not been met?—You must remember these are mixed samples. Of course, the large number which these tables represent would do away with any individual cases.

6209. After all, we have to consider the supply to the public from large sources?—Yes. Taking the whole month I should never get every sample during that month containing separated milk, and therefore I say, even supposing I had had samples similar to what you suggest, my average would not show it; they might be there, yet my average would not show it.

6210. At any rate, you would agree generally that in the milk that gave over 12 per cent. of solids you would expect considerably more than 3 per cent. of fat if it were a genuine milk?—With 12 per cent. of solids I should expect slightly over 3 per cent. of fat—slightly over, that is all.

6211. Have you ever determined to any extent the ash and nitrogens of milks and used them as a means for settling whether a milk is genuine or not?—No, neither the nitrogen nor the ash for the ordinary samples. I have estimated the casein in the cheese-making samples.

6212. It is the case that that remains pretty constant, is it not?—The casein is fairly constant, but it fluctuates mainly with the solids not fat.

6213. The proportion of it varies with the total of the solids not fat?—Yes, as a rule.

6214. But those relations are pretty constant?—Yes. I think they are fairly constant. They fluctuate during the season, you know.

6215. The effect of adding separated milk would be to some extent indicated by a rise in the amount of nitrogen would it not?—A very slight rise.

6216. The ash would be increased, would it not?—Yes, but again very slightly. You see, the ash of milk fluctuates so largely itself that you may certainly find milks with 0·64 and 0·72 of mineral matter, and that allows of 10 per cent. of added water or 10 per cent. of separated milk being present without showing any sign.

6217. To take my case of a rich milk, say, with 4 per cent. of fat or more, to which separated milk had been added, so that it only showed 3 per cent. of fat, or 2·75, to meet your limit, would it not be possible then to ascertain the presence of separated milk by the determination of nitrogen, as shown by the increase in the nitrogen consequent upon that addition?—I think not more certainly than you would by the high proportion generally of solids not fat. I mean to say that you would have the high proportion of solids not fat, and the nitrogen itself would be no more criterion than this high proportion of solids not fat would be.

6218. If you found a low fat, and if you found a high solids not fat, and that was composed of nitrogenous matters in greater proportion than you generally found them in relation to the solids not fat, would you not be suspicious then?—I do not think you would find that nitrogen. The mere fact of separating the milk takes out a large quantity of nitrogenous matter.

6219. Well, what about the ash? Would the ash escape?—Partly with the albuminoids or with the nitrogenous matter which is taken out; that carries out a certain amount of mineral matter with it.

6220. You frequently use yourself, no doubt, the lowness of the ash as a proof of the addition of water?—No, not often.

6221. You do not consider it a useful adjunct?—No, I do not consider it so accurate as the fluctuation in the other solids.

6222. Do you, as an analyst, consider—I rather take it you do—that the position would be very much stronger if analysts had simply to give their figures, and leave courts to determine what construction should be placed upon the figures?—No. I think the analyst has a right to state the conclusion he comes to; but he ought to give his figures also—I think it compulsory.

6223. Then, if certain figures were fixed as limits, do you consider that the analyst should use any discretion as to the expression of an opinion on those figures?—None. I take it that unless the standard fixed is such that it does away with that individual expression of opinion, it will not have the value that is required of it.

6224. Do you think that the genuineness of a milk or otherwise can be wholly and solely expressed by figures?—No, I do not. I have said all along that it cannot be, and that we must take a standard which will limit the amount of adulteration as much as possible.

6225. But you would not have the analyst taking any responsibility, even if he were asked by his committee or other persons, in advising as to whether proceedings should be taken or not?—I think myself that the analyst ought not to advise about proceedings. He has got to report as an analyst, and the committee should decide whether they will prosecute or no. I think at times there has been a certain amount of personal influence brought by public analysts to support their fads, and committees have been induced to prosecute where they have no right to.

6226. Is it your experience that analysts are so very anxious to have prosecutions?—Certainly. It is an advertisement, and how can we advertise ourselves as well?

6227. Do you really consider that it is an advertisement for a public analyst to go into court and prosecute a case?—Yes, of course I do.

6228. What sort of advertisement is it for him if a case is dismissed—is it a sort of advertisement that he is likely to court?—They do not go into court when they expect to lose their cases as a rule.

6229. You mean to say they go into court with the intention of having somebody prosecuted, and whether he is right or whether he is wrong, to get a conviction against him, and that that is the object of their position?—Yes, certainly; they must maintain the position they have taken up; they think it right, others may not.

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6230. But what position have they taken up?—They take up the position of a public analyst, who says: In my opinion this is adulterated; and he must support his opinion, or what use is he?

6231. Is it not your experience of public analysts that they are very careful indeed before they report upon anything as being adulterated, and that their anxiety rather is to be lenient than otherwise?—My opinion is that they are too careful, and that that very carefulness permits of an amount of adulteration which ought not to exist.

6232. (*Mr. Cowan.*) May I understand from what you have said that no matter what standard is fixed it will not altogether prevent adulteration?—That is my opinion.

6233. But in your opinion if a fair standard is fixed it will at least prevent a very large amount of the adulteration that is going on at present?—Yes.

6234. I think you stated that in warm weather the cows generally produce more milk, richer milk, and that it falls away in cold weather, was that so?—I hardly expressed that.

6235. That is what I understood you to say?—I do not think that Professor Thorpe altogether meant that. What he meant was that heat was conducive to the production of high quality milk. There is another aspect; in very warm weather the flies, and the trouble which the cows are put to, both affect the milk, so that it does not always follow that very warm weather will cause an improvement.

6236. No, because the statistics you show us in Table 2, and indeed in other tables that have been brought before us, show very distinctly that as the weather gets colder the cows produce a richer quality of milk. In September and October, you will find that the quality of milk rises considerably above what it is in June, July and August?—That is due, of course, to the increased time since calving, when the quantity yielded is a materially diminishing one.

6237. I perhaps took you up wrong, but I think you meant in your answer to Professor Thorpe that with heat the cows generally produced a richer milk?—Yes, I do mean that. Warmth is conducive to the production of rich milk, but excessive heat, as you know well enough, has the reverse effect, and cold, on the other hand, too; if you have a very cold afternoon, or a very cold night, frequently in the morning you will find the milk very poor.

6238. Is it your opinion that the quality of milk is improving over England within the last few years, or the reverse?—I think it is improving.

6239. In your experience has there been much difficulty in connection with getting milkers?—Not in my experience. I know from hearsay there is a great difficulty in getting milkers.

6240. Where there is difficulty in getting milkers those milkers may not be so well up to their work as they were in previous years?—That is so.

6241. Would that not affect the quality of the milk to a considerable extent?—To a very large extent. The richest milk is the last drawn, and if the cow is not well milked out, if she is not stripped, she gradually loses the power of giving milk; not only is the quality lower but the quantity becomes less.

6242. That may show in a great many samples that may have been brought before you that the poor quality really was not the fault of the cow, but was the fault of the way in which the cow was treated?—It might have been, but I think the men who are sending milk to London know how to get all they can out of the cows.

6243. In the case you brought before us, where you went down and saw the cows milked, had it been reported as being an adulterated milk?—Yes, the farmer was prosecuted for it.

6244. Did you find that it had been quite genuine milk—that the milk you saw taken from the cow was of the same quality as the milk that had been produced before the magistrate?—Yes.

6245. Did you see those cows milked yourself?—Yes, everyone around me.

6246. Was it by the farmer's own milkers or by a milker you thought you could depend upon?—It was the farmer's own milkers who did it.

6247. It was quite easy for the farmer to have his milkers so prepared that they could show an inferior

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sample?—But they did not. They showed me a sample containing over 4 per cent. of fat. If they had shown me a sample containing very little fat I should have said the cows had not been milked out; but they produced a sample containing over 4 per cent. of fat, and I knew the cows must have been milked out.

6248. (*Chairman.*) There is one thing I did not quite understand in your table No. 6, which gives what you call the adulterated samples. The average composition was nearly 4 per cent. of fat, and as much as 8·27 of solids not fat, the total solids being 12·20. You reported that milk as adulterated?—Yes. I say that the milk was reckoned as adulterated by my standard.

6249. You reported, not that in your opinion it was adulterated, but you mentioned in what way you considered it was adulterated?—Yes; I should mention in such case the milk was below the standard, and that, in my opinion, there was something wrong with the feeding. That is how I should put it.

6250. You did not say it had been adulterated by having water or separated milk added to it?—Yes; I should say this milk contained so much added water.

6251. You would have said that?—I should say that, but then I should also say that this added water might have been added by the cow, was due to season and influence of food; but I should state that it contained the added water.

6252. There were no prosecutions on those certificates were there?—No.

6253. (*Professor Thorpe.*) The cow was not put into the dock?—No. The public analyst would have prosecuted on those samples.

6254. (*Chairman.*) I do not know; the public analyst in August, in the dry time, I suppose, exercises a certain amount of discretion on these matters?—I have been called into court on a case like this on behalf of the farmer when he has been prosecuted.

6255. Have you enabled him to escape conviction?—Yes, fortunately. He does not often do so.

6256. I do not know that I quite understood the reply you gave to Major Craigie on the question of feeding. I have been given to understand that you may feed your cow differently as much as you like, yet it will always revert as regards the quality of milk back to where it started from with an ordinary well-fed cow, not with wretched half-starved things; is your experience the same as that; taking a well-fed cow however much you may alter the method of feeding if you cannot very much alter the quality of its milk?—I agree with that. There is a maximum quality natural to that cow, and you may give her twice as much food, and she will not go above that maximum. What I have to deal with is where she falls much below her natural quality, owing as a rule to the want of food. I carried out some experiments for Lord Vernon years ago, and we proved conclusively that you might increase the food to a wasteful extent; but you could not raise the quality of the cow's milk beyond what may be called her maximum limit.

TENTH DAY.

Wednesday, 2nd May, 1900.

PRESENT:

Lord Wenlock, G.C.S.I., G.C.I.E. (*Chairman*).

Mr. George Barham.
Mr. George Cowan.
Major Patrick George Craigie.
Mr. S. W. Farmer.
Mr. Shirley F. Murphy.
Dr. J. Augustus Voelcker.

Mr. R. Henry Rew, *Secretary*.

Mr. A. Steel.

2 May 1900.

Mr. Alec Steel, called; and Examined.

6257. (*Chairman.*) You come before us to-day, I understand, as the Secretary of the Eastern Counties Dairy Farmers' Co-operative Society, Limited?—Yes.

6258. Have you been deputed by that Society to represent them on this question?—Yes. Along with Mr. Primrose McConnell.

6259. I believe you are prepared to submit to us a number of analyses of milk which have been taken from dairies belonging to this Society?—Yes.

6260. Those analyses, I understand, extend over several years?—Yes.

6261. Will you put them in, please, and give us your explanations on the figures?—Yes. I have, first, evidence of samples from my own cows taken at Broomhills, and samples taken at Prittlewell Temple, to show the difference of milkings taken at uneven intervals. One milking was taken at 4 a.m.; the other milking was taken at 12 a.m.; that shows the effect on milk of a short period of milking, and a longer period. Then I have the samples from the Eastern Counties Dairy Farmers' Society, that were sent by the members of that Society to me to be sent to the analyst; and then I have the samples taken by the Eastern Counties Dairy Farmers' Co-operative Society, Limited, of milk, after it was sent into the stations in London. The samples are taken there really from a dairyman's standpoint. The analysis of milk taken at Broomhills shows that in May, 1897, the whole dairy averaged 4·33 of fats, 8·74 of solids not fat, and 13·07 of total solids. In April, 1898, the milk taken from a single cow, old and newly calved, showed 3·90 of fat, 8·42 of solids not fat, and 12·32 of total solids. In November, 1899, the analysis of the whole dairy showed 3·55 of fat, 9·05 of solids not fat, and 12·60 of total solids.

6262. Was this morning's or evening's milk?—Morning and evening.

6263. Mixed together?—Yes. The next figures I have show the analysis of milk taken at Prittlewell Temple in 1900, from cows milked at 4 a.m. on one day in March and one day in April. This is the morning's milk. This is the average of the whole dairy—3·45 of fats, 8·72 of solids not fat, and 12·17 of total solids in one case; and 3·05 fat, 8·87 solids not fat, and 11·92 of total solids in the other case. The average for the whole dairy of the morning's milk of these two instances was 3·25 of fat, 8·79 of solids not fat, and 12·04 of total solids.

6264. How many cows would there be in this herd?—100 cows. Now, I will give you the results of the milking at 12, noon. There is an eight hours interval between the morning milking and the afternoon milking. Two samples of the whole dairy showed 4·65 of fat, 8·95 of solids not fat, and 13·60 of total solids in one case; and 4·58 of fat, 9·31 of solids not fat, and 13·89 of total solids in the other case; the average of these two milkings being 4·61 of fat, 9·13 of solids not fat, and 13·74 of total solids. I have got two samples of fresh calved cow's milk, and two samples of stale calved cow's milk; would you like to hear how they came out?

6265. Yes, we shall be glad to hear anything you have to say?—The first sample of the newly-calved cow (old) milked at 4 a.m. showed 2·80 of fat, 8·47 of solids not fat, and 11·27 of total solids; the second sample showed 2·95 of fat, 9·24 of solids not fat, and 12·19 of total solids; the average for the two samples of newly-calved cow being 2·87 of fat, 8·85 of solids not fat, and 11·73 of total solids. Then the samples of the stale calved cows (old)—two cows within four months of calving down again—showed first 5·50 of fat, 9·39 of solids not fat, and 14·89 of total solids; and second 4·08 of fat, 9·43 of solids not fat, and 13·51 of total solids; the average of these two samples being 4·79 of fat, 9·41 of solids not fat, and 14·20 of total solids. Then there is the afternoon's milkings of the same cows, there being eight hours between the two milkings. The milk of the newly-calved cows showed first sample 3·90 of fat, 9·31 of solids not fat, and 13·21 of total solids; and the second sample 4·47 of fat, 9·55 of solids not fat, and 14·02 of total solids; the average of these two samples being 4·18 of fat, 9·43 of solids not fat, and 13·61 of total solids. The stale calved cows gave in the afternoon in one sample 4·70 of fat, 8·45 of solids not fat, and 13·15 of total solids; in the second sample 3·88 of fat, 9·04 of solids not fat, and 12 92 of total solids; the average of these two samples being 4·29 of fat, 8·74 of solids not fat, and 13·03 of total solids. I have given you the average for the whole dairy. Those samples of milk were taken from a dairy of 100 Shorthorn cows fed on the following rations daily—about one bushel of brewer's grains, one bushel mangold, four pounds of maize meal, two pounds of linseed cake to the twenty heaviest milkers, and four pounds of linseed cake to ten fatters. That is all the evidence I propose to lay before you regarding my own milk. The next is the milk of the members of the Dairy Society that was sent for analysis, and this is the analyst's report. I have altogether here the analyses of 27 samples taken between May 20th, 1897, and April 28th last. I do not propose to read over the results of the different samples unless you wish it, but I will give you one or two facts regarding them.

6266. (*Mr. Barham.*) Who is the analyst; can you tell us?—Dr. Bernard Dyer.

6267. (*Chairman.*) Were some samples taken early this year?—The 28th April this year is the date of the last sample. The average of the fats is 3·94, of the solids not fat 8·89, and of the total solids 12·83.

6268. (*Mr. Barham.*) Is that the average for the three years?—That is the average since 1897. None of these samples came under 3 per cent. of butter fat, only two came under 8·50 of solids not fat, and only two under 12 per cent. of total solids; eleven came over 4 per cent. of fat, seven over 9 per cent. of solids not fat, and ten over 13 per cent. of total solids.

6269. (*Major Craigie.*) Out of how many altogether did you say?—Out of 27 samples. That is all the evidence that I propose to put before you regarding the Dairy Society. Now I wish to take a different field. This is the analysis of the samples of milk from the Co-operative Society, taken at stations in London beginning in 1897.

6270. (*Mr. Barham.*) Is it a Co-operative Society in connection with the members of your Association?—It is in connection with the members of the Dairy Society. In 1897 we took 48 samples; out of that number one was found to contain less than 3 per cent. of fat and 8·50 of solids not fat. I will give you the average of the analysis in quarters; it will not take quite so long. The average for the first quarter from January to the end of March was—fats 3·21, solids not fat 9·02, and total solids 12·23; for the second quarter ending in June 3·67 fat, 8·91 solids not fat, 12·58 total solids; for the third quarter ending September, 3·58 fat, 8·87 solids not fat, and 12·45 total solids; and for the fourth quarter ending December, 3·65 fat, 9·01 solids not fat, and 12·66 total solids, the average for the year being 3·52 fat, 8·95 solids not fat, and 12·48 total solids. In the year 1898 we had 75 samples of milk analysed. Of that number nine were found to contain less than 3 per cent of fat and 8·50 of solids not fat. The reason for taking 3 per cent. of fat and 8·50 of solids not fat is that I propose to ask you to accept a standard of 3 per cent. of fat and 8·50 of solids not fat. I do not mean to say that those low samples were all adulterated, but that some of them come below this standard that I wish to put before you. In the averages that I give here I am giving the low quality samples along with the others; they are all included. In regard to the 75 samples analysed in the first quarter of 1898 they showed an average of 3·73 of fat, 8·96 of solids not fat, and 12·69 of total solids; the second quarter, 3·53 of fat, 8·83 of solids not fat, and 12·36 of total solids; the third quarter, 3·42 of fat, 8·70 of solids not fat, and 12·12 of total solids; and the fourth quarter, 3·38 of fat, 8·85 of solids not fat, and 12·23 of total solids, the average of the year being 3·51 of fat, 8·83 of solids not fat, and 12·34 of total solids. In 1899, 194 samples of milk were analysed, and 37 were found to contain less than 3 per cent. of fat and 8·50 of solids not fat. The first quarter showed 3·45 of fat, 8·99 of solids not fat, and 12·44 of total solids; the second quarter, 3·27 fat, 8·85 solids not fat, and 12·12 total solids; the third quarter, 3·14 fat, 8·86 solids not fat, and 12 per cent. of total solids; and the fourth quarter, 3·49 fat, 8·90 solids not fat, and 12·39 total solids; the average for the year 1899 being 3·33 fat, 8·90 solids not fat, and 12·23 total solids. In 1900 65 samples were analysed, of which 12 were found to contain less than 3 per cent. of fat, and 8·50 of solids not fat. The samples in the first month were found to contain 3·20 fat, 9·06 solids not fat, and 12·25 total solids; in the second month 3·34 fat, 8·79 solids not fat, 12·13 total solids; and in the third and fourth months—that is, up till April—3·56 fat, 9·11 solids not fat, and 12·67 total solids; the average for 1900 being 3·36 fat, 8·98 solids not fat, and 12·35 total solids. The average over the four years of these 382 samples was 3·43 fat, 8·91 solids not fat, and 12·34 total solids. Those 382 samples were taken from milk delivered at stations in London from the dairies of 35 farmers. The milk from 22 of those dairies was not at any time found to fall so low in quality as 3 per cent. of fat and 8·50 of solids not fat. Of the 59 samples analysed that were found to contain less than 3 per cent. of fat and 8·50 of solids not fat, 21 samples came from one dairy, 12 from another, and seven from another; so that 40 out of the 59 samples found deficient in quality came from three dairies. When it is considered that a large proportion of the 382 samples analysed were taken from consignments sent by half a dozen farmers that were often found to be sending low-quality milk, and that the whole of the samples were taken from the standpoint of dairymen on the look-out for adulterated consignments, and when the samples at the time they were taken were more or less regarded as suspicious, and were generally from the morning delivery, which, as a rule, contains the lower quality of milk, I think it must be admitted that, under the circumstances, to get an average of 3·43 fat, and 8·91 solids not fat, which is equal to 12·34 of total solids, from the 382 samples submitted from the Co-operative Society, is as forcible an argument as can be put forward for raising the present Somerset House standard.

6271. What do you say is the present Somerset House standard?—We have always been led to believe that if a sample of milk would show 2·75 of fat and 8·50 of solids not fat, it would pass Somerset House.

6272. So that your suggestion is that the 2·75 should be raised?—Yes, that is my suggestion. When it is further taken into consideration that these figures must be much lower than the average quality of milk sent from the 35 dairies or of the general average quality of milk from dairies in the Eastern counties—you will recollect that I gave you the Broomhills milk, which I may say showed an average of 3·94 fat, 8·89 solids not fat, and 12·83 of total solids, and the average of the Prittlewell Temple milk 3·93 fat, 8·96 solids not fat, and 12·89 total solids, and the analyses of the 27 samples of milk handed to me as secretary to the Eastern Counties Dairy Farmers' Society by several of the members to be sent to the analyst—several of which were duplicates of samples taken by the inspectors for the purpose of analysis, and which contained an average of 3·94 fat, 8·89 solids not fat, and 12·83 total solids—when that is taken into consideration, it clearly shows to my mind that a standard of quality fixed at 3 per cent. of fat, and 8·50 of solids not fat—equal to 11·50 of total solids; or, failing that quality in either fats or other solids, if the milk contains 12 per cent. of total solids—it will make a reasonable minimum standard. Speaking personally, after investigating during the last six months over a thousand analysed samples of milk with the analyst's report attached, I feel sure there will be no undue risk of punishment to producers if the minimum standard of quality was fixed at 3·20 fat and 8·80 solids not fat, making 12 per cent. of total solids, and that such a standard would simply turn out a blessing in disguise to both the milk-producing industry and the milk-consuming public.

6273. (*Mr. Murphy.*) Do you think that dairy farmers at the present time would be able to comply with a standard of that sort, or, assuming that standard that you have just recommended to be adopted, do you think there should be an interval of time between the announcement that their milk will be judged by it, and the putting of it into force?—From the results I have just shown you, I believe at the present time it is quite within the limit. Those samples of milk, the averages which I read to you, from the Co-operative Society, were samples that were taken in London from suspicious consignments, and they were all over 12 per cent. in total solids.

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6274. Do you think that dairies having a very limited number of cows—say, two or three cows—would be able to maintain a standard of that sort?—There would be no difficulty at all if the cows calved at different times.

6275. It is within the control of the dairy farmer, you think?—It is quite within the control of any dairy farmer. Of course, it is quite within their control to have a much higher standard, only it would mean less milk; a higher standard means a smaller quantity from the cow.

6276. (*Mr. Farmer.*) How do you account for those three farms being under 3 per cent.? You said 21 samples came from one farm, 12 from another, and seven from another?—I told you that 21 samples came from one dairy; they were marked in the analyst's report, as a rule, "Adulterated"—sometimes with skimmed milk, and sometimes with water.

6277. Then do you contend that out of the 22 dairies seven of them adulterated their milk?—I said half a dozen of them sent a low quality of milk.

6278. Are you of opinion that that half a dozen adulterated the milk?—I am afraid we cannot arrive at any other conclusion but that sometimes they do.

6279. It is rather a serious thing, if it is so, and if it is not so, six out of 22 is a very large proportion?—I think that is not quite what I said. What I said was that the milk from 22 of those dairies was not at any time found to fall so low in quality as 3 per cent. of fat and 8·50 of solids not fat, and that those 382 samples were taken from milk delivered at stations in London from the dairies of 35 farmers.

6280. Then it is six out of 35?—Yes. Those samples were taken as in the position of dairymen—from their standpoint, that is. We were looking for adulterated samples, and we took those samples.

6281. Still, it implies that one out of every six of the members of your Co-operative Society adulterated his milk, does it not?—It implies that there is a certain amount of adulteration. Of course, there are samples of milk under 3 per cent. of fat that may not be adulterated.

6282. I did not quite gather how those Prittlewell Temple cows were fed. I think you said they had a bushel of mangolds per day, and a bushel of grains?—Yes.

6283. And then you said what?—Four pounds of maize meal.

6284. Did all of them have four pounds of maize meal?—Yes.

6285. Did all of them have two pounds of linseed cake?—The 20 heaviest milkers did.

6286. So that the great bulk of your herd only had four pounds of maize meal in addition to a bushel of grains and a bushel of mangolds?—Yes.

6287. What dry food did they get?—They had a proportion of hay and chaff.

6288. And with that food they produced that very rich milk you speak of, up to something like 4 per cent. of fat?—Yes.

6289. (*Mr. Barham.*) I did not quite understand you. I thought, in the early part of your evidence, you suggested that the new standard should be 3 per cent. of butter-fat and 8·50 non-fatty solids?—Yes.

6290. Or 12 per cent. of total solids?—Yes.

6291. Then just in conclusion, I thought that you recommended another standard?—Speaking personally I did.

6292. What was that standard?—3·20 and 8·80.

6293. You recommend that personally?—Yes.

6294. But you do not recommend that on behalf of your association?—No, I do not. I think our members are a little timorous over the standard. I think if they really went into the analysis of milk and saw the returns of a number of analysts' reports they would want a higher standard than they do. I am pretty sure of it.

6295. It is not so much an average as the minimum they want covered?—We cannot legislate for the minimum. We want a good thing. People have no right to produce milk of a low quality. To-day in Essex what we want is to produce quantity of milk. We do not care twopence for quality, simply because we know there is no danger of coming under the standard.

6296. You think the farmers in Essex generally would not mind reducing the quantity, say, one-third, in order that they may produce a better quality?—If we could get the cash for it.

6297. You must take your chance of that, of course; that, I take it, is your argument?—My argument is that we can produce better milk if we are asked to do it.

6298. At a reduction in the quantity, say, of 25 or 20 per cent., or something of that sort?—There is no doubt at all that if you produce better milk you will get less of it.

6299. Do you think farmers as a rule are prepared to accept that?—I am sure they are if the other results were sufficient.

6300. And they would stand their chance of getting a higher price?—Yes, I think they would be quite willing to.

6301. You gave in 1899, I think, 194 samples?—Yes.

6302. Of those, I think, you said 37 were under the standard that your society recommends?—Yes.

6303. That is equal to 19 per cent. of the number?—Yes.

6304. Would your members, think you, be prepared to accept 19 per cent. of prosecutions?—Yes, I am perfectly sure they would.

6305. One out of five farmers being prosecuted for sending in milk below the standard?—Most of those samples that were under came from one dairy.

6306. And these were sent to a co-operative society?—Yes.

6307. That is to say one partner sending from his place of production to his place of sale, or one individual or a number of individuals?—More or less, yes.

6308. Then again, I see it works out to exactly the same in 1900?—Yes, much the same.

6309. But in 1898, for some reason or other, it only works out to 8 per cent?—Seventy-five samples were analysed, and nine of those were found to contain less than 3 per cent. of fat and 8·50 solids not fat.

6310. Are we to suppose that these members sent to a co-operative society milk that was returned by your analyst from time to time as being persistently adulterated, and that your society continued to receive it?—No, I do not suppose so.

6311. Not only for a year, but going in for a second, year, I think?—No, we do not expect to.

6312. It is all through 1899, and also in 1900 that it continues?—Yes, I know that. We do not mean to accept milk that is adulterated.

6313. Then I take it that some of those fell out, and new adulterators came in?—The larger quantity of those samples came from one dairy.

6314. Did you continue that dairy for 18 months, and allow the man to go on adulterating the milk?—Yes.

6315. The whole of the time?—Yes, it was adulterated there is no doubt.

6316. I see; you allow one of your co-operators to keep on adulterating his milk for a period of 18 months?—No, we do not, if we can stop it.

6317. But then you have this report every day?—You do not have it every day.

6318. Once a week then?—There are a great number of samples from that same dairy showing 3·50, and 4 per cent. of butter fat.

6319. Showing that the men sent it straightforwardly apparently?—Yes.

6320. Because if he wanted persistently or systematically to adulterate his milk he would take cream from it when it had 4 per cent. of butter fat?—Yes.

6321. And not when it had 3 per cent. so as to reduce it to less than 3 per cent?—Some people do not consider they are adulterating milk if they abstract cream as long as it passes the Government standard. As long as he produces milk to pass the Government standard no one can say anything.

6322. We will not argue that, but the law as it at present stands says you must not adulterate milk; that is to say you must not water it nor take cream from it no matter how much cream there was in it originally so far as the Act of Parliament is concerned?—If you are only going to get a price for your milk that will pay for milk with 2·75 of fat, you can hardly blame a producer for abstracting a little cream if he has milk which has 3·50 or 4 per cent. of fat.

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6323. But there is no justification for fraud whatever the price might be?—No, but still you get the shelter of the law, and our conscience does not go very much stronger than that.

6324. I see; it comes back very much to what I said at first, namely, supposing your co-operator is sending adulterated milk you keep on taking it for a period of eighteen months?—We have contracts, and, of course, when we send back a report showing the analysis of the milk it comes all right for a time.

6325. What became of this milk; did your association sell it?—Yes, that was contracted for a year, and we had the samples taken at the station.

6326. When you received it you did not throw it away?—It really never entered our hands. It was taken from the station by the dairyman. When we took the samples we took them at the station unknown either to the dairyman or to the farmer.

6327. The chances are that for the whole period of eighteen months the dairyman that you sold the milk to was not a co-operator?—No, I do not suppose he was.

6328. For 20 per cent. of the milk you sold him he was liable for prosecution?—No, he was not.

6329. Yes?—Not in many cases.

6330. Tell me why he was not?—Because you can produce milk under 3 per cent. and 8·50 per cent. without prosecution.

6331. No, the Somerset House standard is 3 per cent. of butter fat?—We have not found that as far as we have been able to ascertain from Somerset House. We have had returns from the analyst who said the milk was watered under 3 per cent. of fat and 8·50 of solids not fat, but when the reference was made to Somerset House they passed the milk which the analyst said was watered.

6332. (*Chairman.*) Is not the Somerset House standard the same as that of the analyst you have just referred to?—The Somerset House standard—at any rate I believe that has been the rule in the past—is 2·75 and 8·50.

6333. (*Major Craigie.*) To what date do you refer?—I refer back three or four years.

6334. (*Mr. Barham.*) I am asking questions on the last 18 months, and I am not taking any period previous to that. I am asking on the 1899 and 1900 figures you know?—Yes.

6335. You see your figures work out 194 samples analysed in 1899, of which 37 per cent. were below 3 per cent. of fat and 8·50 of solids not fat?—Yes.

6336. And this year 65 samples have been sent for analysis, of which 12 were found to be under those limits?—Yes.

6337. Making 19 per cent. for the two years?—Yes.

6338. It is awkward for your dairyman that buys the milk, that is all I can say?—I am afraid it is awkward for a lot of them.

6339. No doubt it is found to be so?—Yes.

6340. (*Mr. Cowan.*) I see you use brewers' grains and mangolds pretty largely?—Yes, I do.

6341. Is that general in your county?—Yes, it is very general.

6342. Do you find it to benefit the quality of the milk at all?—We find it to benefit the quantity, and that is what we look to; we do not look to quality; we have no reason to do it.

6343. Do you consider you can improve the quality by judicious feeding?—I believe you can slightly.

6344. I think you replied to Mr. Barham's question just now by stating that in increasing the quality you reduce the quantity?—Yes. I believe that to improve the quality you must breed to it, and to get quantity of milk you can feed to it.

6346. Did you not reply to Mr. Barham that by feeding, in raising the quality to some extent, you reduced the quantity?—Yes, you reduce the quantity.

6347. But you hold that it is principally by breeding that you would increase the quality?—Yes, I hold that.

6348. What kind of cows have you in Essex?—I have entirely Shorthorns, but there is a number of Ayrshires, only the Ayrshires have been pretty well crossed with Shorthorn bulls.

6349. Is there any difference, so far as you know, between the yield of the two?—I think, if anything, the Ayrshire gives a little richer quality of milk. It is a little richer, I think, as far as I have been able to find out, and as far as I have heard.

6350. Are there any quantity of cross-breed cows?—There is a great number of cows bred between the Ayrshire and Shorthorn bull in Essex, in fact, the Scottish farmers who come up with Ayrshire cows are all crossing them with Shorthorn bulls.

6351. Is that with an expected advantage in the yield of the milk, or do they find that the cows are more valuable when they put them out of the stock to sell as fat as they do in Scotland?—They find that they give quite as much milk, and they find that the carcase of the cow is very much more valuable. They find one thing more—that they are easier milked than the pure-bred Ayrshires.

6352. Owing to the teats?—Owing to the teats being rather larger.

6353. That is with respect to the first cross between the Ayrshire and the Shorthorn. Has it gone any further than that?—Yes, it has gone into the second and third cross.

6354. Do they still continue?—They still continue to do very well. Of course, we find the results showing clearer in the first cross than in the second or third.

6355. In speaking of the milk supplied by the Eastern Counties Co-operative Society, do I understand that it is about the average that you have given?—I gave the average of all the samples that were analysed, including those that came under 3 per cent. of fat and 8·50 of solids not fat. Those samples were in each average, and each average came out to over 12 per cent. of total solids; in fact, they worked out very regularly—8·95 solids not fat, 8·83, 8·90, or something like that, and they vary very little in the fats—3·52, 3·51, and 3·33. They are very regular; there is very little variation in the quality as far as I can make out.

6356. And that is the average of all the dairies under the Eastern Counties Association?—The total average over the four years for the 382 samples that were taken by the Co-operative Society was 3·43 fat, 8·91 of solids not fat, and 12·34 of total solids.

6357. Including the adulterated samples?—That includes every sample that was adulterated, it was all given together.

6358. You seem to have a good many dishonest men in connection with the Society?—No; I said we had one man who sent in a great proportion of the samples that were under.

6359. You see, you have 37 out of the 194, which is a very large proportion, and then you have 12 out of the 65?—I say the 21 samples of that adulterated milk came from one dairy, 12 from another, and seven from another—40 out of the 59 came from three dairies.

6360. You show a very great difference between your morning's and evening's milk—nearly as much as 1·50 per cent.?—That is so; and those figures are taken for the purpose of showing the evil of this uneven milking when you milk at 4 a.m. and 12 noon. We milk at those times to suit the dairymen, but we should much prefer that it was put an end to.

6361. What would be the difference with regular hours of milking?—With regular hours there is really no difference in the milk. A cold night or a cold day will make a difference, either morning or evening; but otherwise there is really no difference in the milk, as far as I can find out, if it is done at regular periods.

6362. Is it your opinion that there would be much difficulty in arranging for regular hours of milking?—There would be no difficulty at all, and we should be very glad of it.

6363. You are thinking of the producer, but what about the town supply?—There would be no difficulty there, I think.

6364. We have had evidence before us showing that the towns demand milk in the afternoon or evening, and that that is the cause of the irregularity in the hours of milking?—Of course, there is a feeling that milk will not keep, but, with the refrigerators and the cold water that we have now, there is no difficulty in milk keeping twenty-four hours or longer if it is wanted, at any time of the year; that is a perfect chimera.

6365. Have you any difficulty in getting milkers in Essex?—It is getting a little difficult now.

6366. Are they all men or women?—All men; there

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are no women milkers in Essex; we should be very glad if they would learn.

6367. Where there is a difficulty in getting milkers, very likely you would get some bad milkers who were not accustomed to it; and if that was so, that would show they were not exactly doing the cow justice; and that might be a reason for getting poor milk?—There is no doubt a bad milker makes a cow give a lower quality milk, because the strippings is really the rich milk. The good milker that strips out clean and does it cleverly is the one that gets the richest milk from the cow.

6368. Have you any experience in Essex of separated milk?—No, I think there is hardly one separator in it. I think Mr. Barham could tell you that. None of the Essex farmers have separators.

6369. Could you suggest any standard for separated milk, or rather, I should say, for hand-skimmed milk?—I think 1 per cent. of fat should be as high as it would stand; it would stand about that, as far as I have been able to learn.

6370. Would you allow separated milk and hand-skimmed milk to be sold together?—You could hardly get separated milk to give you 1 per cent. of fat—it would come very much under, I should think.

6371. How would you distinguish the two?—You would have to put it on the cans the same as it is compulsory now. You must not take out separated milk now unless in a can with a label in large printed letters under this new Act.

6372. (*Major Craigie.*) Under the new Act, did you say?—Yes, I am referring to the new Act.

6373. There is no section in the new Act which compels that?—I thought there was.

6374. Do you refer to Section 11 of the Act?—I cannot tell you what the section is, but I believe you must have "separated milk" printed in large letters now on whatever can you carry it in.

6375. That is in the case of condensed milk?—No, separated milk.

6376. Condensed milk, when it is separated, has to be so marked; are you referring to Section 11?—(*After reading the section.*) I expected that it referred to the separated fresh milk.

6377. Section 11 of the Act of 1899 only refers to condensed separated or condensed skimmed milk?—Yes, I have made a mistake.

6378. I am referring to the Act of last year?—And that is the Act I mean.

6379. There has been a good deal of misunderstanding about that, I think?—There has been a good deal of misunderstanding, because I have read different authorities on that subject.

6380. I do not know whether you have seen some reviews on the subject which inserted certain commas which were not in the Act of Parliament—and some convictions have been obtained on those commas, too?—I think it is a very great pity, not only to the farmer, but to the public, that it should not be law that "separated milk" should be marked in large letters on every can of separated milk as sold. There should be no whole milk and separated milk sold mixed.

6381. (*Mr. Cowan.*) Have you any experience of cream?—No, none, or very little.

6382. Have you sufficient experience to enable you to suggest a standard for cream?—I should say about 30 per cent. would be about the fair standard.

6383. (*Dr. Voelcker.*) The summary of your experience is that the dairy farmers of the Eastern Counties have no difficulty in producing milk which would give 3 per cent. of fat and 12 per cent. of total solids?—None whatever.

6384. And that even if the standard were raised above that to 3·20 for fat, your own opinion is that they would not have any difficulty?—None at all.

6385. But that as long as the standard is kept down to what is believed by some people to be the present standard—2·75—there will be increased adulteration?—Certainly there will.

6386. Further, even if it stops at 3 per cent., there may in the Eastern Counties be a considerable amount of adulteration still?—It will reduce it greatly.

6387. It will reduce the tendency?—Yes, it will.

6388. But it will be quite possible that adulteration will go on with the 3 per cent.?—Yes, certainly; it will be quite possible.

6389. What are the forms of adulteration that you have come across?—Separated milk and water.

6390. Is the adulteration in consequence of separated milk being added directly to whole milk, or of fat being removed from whole milk?—It may be either, but I believe it is generally owing to separated milk being mixed with the whole milk.

6391. Where does the separated milk come from?—Do you mean in the county of Essex?

6392. Yes?—I almost think that there is no separated milk in the county of Essex, but there may be some skimmed milk.

6393. Hand-skimmed?—Yes. I only know of one separator in the whole of Essex.

6394. But it is quite feasible for farmers to remove part of the fat and add hand-skimmed milk to their whole milk?—It is very difficult to do it under our system, because we send away the milk directly it is milked. Of course, you cannot hand-skim milk unless it has been six or twelve hours in the pan, or something like that.

6395. Unless you have a separator?—Unless you have a separator, and I only know of one in the county.

6396. (*Mr. Barham.*) Does the owner of that send milk to London?—He is a landlord.

6397. (*Dr. Voelcker.*) Then I may take it that this addition of separated milk direct to whole milk does not occur largely?—Very seldom, I should think.

6398. Does watering occur much?—Occasionally it will.

6399. I suppose whatever standard may be fixed there will be those who will endeavour to sell milk that still passes that standard, but does not get very much better?—I have no doubt there will. I do not think that anyone has a right to tamper with milk, but I think the farmer has quite as good a right as the dairyman, and of course it is the duty of the Government to prevent that.

6400. Has the system of testing milk by your analyst done much to check adulteration?—Yes, it has done a good bit since we first commenced as a society.

6401. Now, you said, or rather hinted, that it was not necessary nor was it politic to give a better quality of milk than was required by the authorities?—Yes.

6402. And you hold, and some other witnesses have held before us, that if a farmer has a rich milk he is not doing anything wrong in removing some of the fat and selling the milk, so long as it comes up to the standard which is in force?—No, I do not hold that.

6403. Something you said would rather lead to that belief, would it not?—Yes; I said that we could do that and shelter ourselves behind the Government, but I do not conscientiously say that any farmer has a right to do it.

6404. Would you regard such removal of fat in the case of rich milk as adulteration?—It depends how you would put it.

6405. I will put it in this way: A farmer has milk which in the morning gives 3·50 per cent. of fat, and the evening milking, or rather the day milking, gives 4·50; is he right in saying, "Why should I give this 1 per cent. of fat away; am I not justified in removing it?"—Well, it depends on how you look at it. If the farmer has sold his milk at 2·75 per cent. of fat and 8·50 of solids not fat for so much money, is he justified in giving away a higher quality of milk at the same price?

6406. So you put it, If he does not get any more for his afternoon milk of 4·50 per cent. than he does for his moring's milk of 3·50, he is justified in taking it down to 3·50?—I do not say he is justified, but I say that he can do it without coming under the lash of the law.

6407. So that if a standard be not fixed which takes in the higher quality of evening milk there will undoubtedly be in the Eastern Counties a good deal of removal of fat from milk still going on?—I believe there will be very little of it, and I believe there is very little of it now. There is hardly such a thing, I believe, in Essex. There may be one, or two, or three, as I have shown, but there is very little of it.

6408. You do not consider that adulteration does go on to any large extent?—Not at all largely, only a very few cases.

6409. These cases that you have mentioned to us are rather exceptional ones?—They are quite exceptional;

I brought them here because I simply wanted to put before you the lowest quality of milk that is being produced in Essex, and I have done so.

6410. Do you consider you have the means of putting your hand on adulteration where it does exist?—Yes, we can.

6411. But your difficulty, up to the present, has been the belief that a low standard has been in existence?—Yes.

6412. And a general feeling on the farmer's part of why should he give more than is required?—Yes, there is a feeling of that sort, and I think it is a very justifiable feeling too.

6413. You say there are a good number of Ayrshire cows; have you come across a good many Dutch cows?—There are a few—not many.

6414. Are they good dairy cattle?—They give a lot of milk.

6415. Good quality?—Rather low, generally.

6416. Do you think you should legislate for Dutch cows?—I think it would be better to be mixed with good Shorthorn or Ayrshire milk.

6417. In fixing a standard, is the importance of Dutch cows in the Eastern Counties sufficient to lead us to take them into serious account?—I do not think that we have any right to legislate for the low quality milk.

6418. As far as your experience goes, is there much difference between the quality of the milk as sent away from the farms and the quality of the milk as it comes into sale in the towns?—You mean the quality of the milk after it passes through the hands of the retail seller—the distributor?

6419. Yes?—There is a good bit of difference.

6420. Have you anything to show that, or is it only a general belief?—I know for a fact that there is a difference.

6421. Have you any cases where farmers who have been able to show that the milk sent away from their farms or to your society was of good quality have been brought to book afterwards because the milk they sent up has been reported as adulterated?—Yes, we have had several cases of that sort.

6422. Has it been made clear in those cases that adulteration has taken place by retail vendors?—Yes, although it is a very difficult matter to bring it out against the retail vendor, for the simple reason that the milk goes into the retail man's dairy, the retail man sells it out through his man, the sample is taken in the street from the man, and the man and the master both declare in court that they sold the milk as they got it under a guarantee of purity by contract and by label. The farmer has no means after that of proving his innocence. We had a case not very long ago where a farmer sent his milk to a retail dairyman; a sample was taken in the street after the milk had stood a night in the station, some hours in the retail dairyman's yard, and had been on the street for an hour or two. The dairyman and his man cleared themselves by showing their guarantee, and declaring that they sold the milk as they got it from the farmer. The farmer was summoned, and there is not the slightest doubt but that he would have been convicted, as he had not a jot or tittle of evidence to give, barring himself or his man, to show that he had sent pure milk, although he knew he had done it—and there is no doubt at all but that he would have been convicted only, at the eleventh hour, the retail dairyman stood up in court and begged to get the farmer off, and he got off because the retail dairyman felt sure himself that the farmer had sent pure milk. It is a very unjust law.

6423. Have you anything to suggest by which the farmer who sends milk in should be protected in such cases as you have mentioned?—If a farmer is summoned for adulterated milk the sample ought to be taken in the station, and it ought to be divided into three parts —now there is only one sample taken—and one sample returned to the farmer or given to the station-master as a reference.

6424. What we have to look after is what the public gets; if the samples were only taken at the station, how should we secure what happened afterwards?—You must make the dairyman responsible when he takes the milk away from the station; he must be responsible after that. It is most unfair that a farmer should be responsible for milk after it leaves the station and is entirely out of his control. He has to pay for the carriage of the milk to the city station, and it is most unfair that after that he should be held responsible.

6425. Does the retail man know in all cases from which farmer the milk that he sells comes?—In every case.

6426. In every case?—Yes, unless it comes through wholesale agents.

6427. So that if he has milk standing on his counter he would be able to tell from what farm that comes?—If he buys his milk from the Eastern Co-operative Society he would know in every instance.

6428. In the case of your society he would know?—In every instance he does.

6429. Might it not be advisable to suggest, if a sample be found adulterated as taken from a retail vendor, that subsequently a sample should be taken from the delivery of that farmer at a railway station?—Certainly.

6430. Would you consider that to be a fair way?—I should think that is quite fair.

6431. Would you suggest that being done?—It would be much better if it were taken at the station of delivery by the farmer. Of course, the farmer has to pay the carriage, and he can hardly get out of the sample being taken at the city station.

6432. Have you had yourself any difficulty with regard to the railway company and the transit of milk on railways?—We have sometimes had difficulties, but we are getting pretty well over them.

6433. With regard to locking the churns?—They will not accept locked churns.

6434. Is that only general belief on your part?—That is the case.

6435. Have you anything definite to show that?—Yes. We had it from the Great Eastern Superintendent within the last month.

6436. (*Major Craigie.*) That the railway company would not accept a locked churn?—Yes.

6437. Not under any circumstances?—Not under any circumstances. They say they will not take a churn of milk unless they can see the quantity of milk that is in it.

6438. (*Mr. Barham.*) We are having milk every day from Lord Walsingham coming up by the Great Eastern sealed?—It may be done by favour, but we have tried it in several instances, both locked and sealed, and they have absolutely refused to carry it. They say that they will see the quantity of milk that they carry.

6439. (*Major Craigie.*) Have you seen the correspondence that has been published lately in the Press, the Board of Agriculture Journal, and elsewhere, on behalf of the railway companies, signed by Sir Henry Oakley, declaring that there is no foundation for the belief that the railway companies do not accept milk in locked churns?—I do not think that is the name, but I saw something about it the other day in one of the agricultural papers; but it was quite wrong.

6440. The statement on behalf of the railway companies, officially answering the Board of Trade upon inquiry from the Board of Agriculture, is that there is no such regulation, and that the railway companies do accept locked milk churns at the same rate as unlocked milk churns, only reserving to themselves, in the case of any suspicion about the quantity, the right to open in certain suspicious cases?—That has not been the case with the Great Eastern; they have refused to take it.

6441. Within the last month?—No, not within the last month, and I cannot say within the last twelve months. I do not think we have tried it for several years, but we did try it. Then that is no preventative at all. I have stood on a railway bridge and seen porters tip the churns over and let the milk out, and tip the water in without ever touching the lid, so that it is no preventative at all, and it really does not matter whether the churn is locked or not; it makes no difference.

6442. (*Dr. Voelcker.*) Is it your belief that abstraction of milk and adulteration of milk take place during transit?—Not much now; it did more or less at one time.

6443. But not much now?—Very little now, I think.

6444. Is it necessary to legislate in any way for that?—I do not think so at all. I think milk now is very little tampered with on the railway.

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6445. Have you had any difficulty on behalf of any members of your society with regard to the way in which the samples are taken?—Yes.

6446. Have you had any complaints as to the way in which inspectors have taken the samples—to the effect that they have not taken them fairly?—No, we have not had anything of that sort.

6447. Is much cream sent from the Eastern Counties?—Very little; it is all full milk.

6448. And not much butter made?—None at all.

6449. (*Chairman.*) Among all this milk that comes under your observation from the Eastern Counties, is there much from Jersey cattle?—Very little.

6450. And any, as far as you know, from Dutch cows?—There is some.

6451. But very little, would you say?—I know of several dairies where there are perhaps sixty or eighty cows, and there may be a dozen of them Dutch; and there are one or two dairies I know where they are nearly all Dutch, and I know the quality of the milk is very low.

6452. You mentioned Ayrshire cows; do you come from Scotland yourself?—Yes.

6453. What part of Scotland?—Ayrshire.

6454. Perhaps you would not mind for one moment directing your attention to a question I am going to put to you. A gentleman who came before us from Glasgow, and who is in a large way of business there, was asked, "What are the real arguments that cause you to believe that 2·75 is a fair and reasonable limit for fat?" "Because Glasgow," he says, "is altogether supplied, or nearly entirely supplied, by the product of Ayrshire cows, which has been proven, from time to time, to be of a much lower percentage of fat than the Guernsey, the Jersey"—that is quite true of those—"and other South of England cows." The South of England cows he said there, but I suppose he meant the Shorthorn. Then he is asked, "Do you know that Dutch cows are still to be met with in relatively large numbers in Essex?" and he says, "I was not aware of it." "If you were aware of it, or made aware of it, do you not think that would affect the quality of the milk supply in the South of England?" "It might. I suppose the Dutch cow is something like the Ayrshire cow as to quality, but I suppose the percentage must be very small." Do you agree that the Ayrshire is a cow that gives such very poor milk?—No, I do not.

6455. Then you do not at all agree with this witness that Ayrshire cows cannot give a higher percentage than 2·75 of fat?—No, I do not agree with that at all. I think there is another reason for that; I could give you the reason.

6456. Perhaps you should?—The Ayrshire dairy farmers nearly all send their milk into Glasgow, and they send both milks at the same time. They send one milk skimmed and one milk whole, and the cream and the skimmed milk separately. I believe, indeed I know for a fact, as I have been told by a dairyman who made his money in the milk trade in Glasgow, who is now a farmer in Essex——

6457. (*Dr. Voelcker.*) A Scotchman?—A Scotchman; he told me that he made his money by mixing the skimmed milk and the whole milk and selling it as whole milk; and I believe that is the cause of the Ayrshire cows giving such poor milk.

6458. (*Chairman.*) You do not say from your own knowledge that the Ayrshire cow is a very good milker?—The Ayrshire cow, as far as I can find out, taking the average of Ayrshires and taking the average of Shorthorns, will be rather higher than the Shorthorn.

6459. (*Dr. Voelcker.*) The gentleman you have just referred to is not the gentleman who has supplied the twenty-one samples?—No.

6460. (*Major Craigie.*) I did not quite understand your answer to a question put by one of my colleagues as to the dividing of the sample; did I understand you to say that the samples taken are not divided into three parts?—The sample taken at the station by the inspector is not divided, and the farmer has no means at all of being aware that a summons is coming until it arrives. Samples taken on the London street from a retail dairyman's can are divided, and the dairyman has an opportunity of sending the duplicate sample to his analyst and of being aware whether there will be a summons arrive or not.

6461. (*Dr. Voelcker.*) But no prosecution could take place if that were not done?—They do it; we have had cases of farmers being fined over and over again; and it is most unfair.

6462. (*Mr. Barham.*) There are two methods of taking samples, one is by purchase, and the other is in course of transit without purchase, and under the old Act it was not necessary to divide into three portions that sample which was taken in course of transit; but under the new Act that has been provided for, and that must be divided into three parts, the same as any sample that may be purchased?—That is under the 1899 Act, you mean?

6463. Yes?—Under the 1875 Act it was necessary to divide, but under the amendment Act of 1879 it was not necessary after that to divide samples taken in the station by a qualified inspector.

6464. That is samples taken in transit?—At a station.

6465. (*Major Craigie.*) Under the Act of 1879?—Yes, the amendment Act of 1879.

6466. Is not the difference that between taking the sample by an official and taking the sample by a private person?—No, it is the taking of a sample at the station; that does not require to be divided. But if the sample is taken on the street by an inspector, it must be divided then into three parts. In the one case it comes against the farmer, and, in the other case, it comes against the dairyman; and it is most unfair that the farmer should not have the same privilege as the dairyman.

6467. (*Mr. Barham.*) He has under the new Act?—Yes.

6468. (*Major Craigie.*) Under Section 3 of the Act of 1879 medical officers, sanitary inspectors, inspectors of weights and measures, market inspectors, or police constables—one of the officials under the local authority—may take a sample at the station; and your contention is that this sample so taken does not require to be taken under the same conditions as it would be on the street?—I say it ought to be divided the same as they are.

6469. (*Mr. Farmer.*) You say it has been rectified under the new Act, do you not?—Mr. Barham said so.

6470. (*Major Craigie.*) The terms of Section 10 of the new Act are that the person taking the sample—that is, in course of delivery—shall forward by registered parcel or otherwise a portion of the sample, marked and sealed, or fastened up, to the consignor, if his name and address appear on the can or package containing the article sampled. By the new Act, therefore, your difficulty is got over in the event of a marked can?—Yes. I even go further than that. I say no farmer ought to be convicted for adulterated milk after the milk has left the station.

6471. Has left which station?—After the dairyman has taken possession of it, after it has been signed over to the dairyman at the station.

6472. Is the dairyman in possession of the milk at the station of arrival?—Yes.

6473. You mean at the London station of arrival?—Yes. Of course, the milk really belongs to the farmer till it comes there, because he has got the carriage to pay. I say no farmer ought to be summoned for milk after it has been signed over at the station. Under the old Act they were liable till it went into the hands of the consumer.

6474. (*Mr. Barham.*) In the event of a farmer adulterating his milk, as you say several of them have done, do you not think he ought to be responsible for it until it is sold?—No, not at all.

6475. You think that if he adulterates it, once it gets into the dairyman's hands the dairyman should be responsible for the adulteration?—Certainly. The dairyman has the privilege of having the inspector at the station to have the milk sampled.

6476. He cannot have the inspector there every day and twice a day?—You know pretty well if you are getting milk from a farmer who adulterates his milk, and you can easily clear yourself by having an inspector there.

6477. You say sometimes these same farmers send you 4·5 per cent. of butter fat and another time only 2·5; you may have an inspector there four times and get 4·5 per cent. of butter fat, and he is not there the fifth time,

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and you may get it adulterated?—Yes, but you have the privilege of the inspector at your hands.

6478. It is difficult to get them to come; they are public men, and they cannot always be running after each farmer?—There are very few cases, taking the whole of the adulterated milk coming into London from the Eastern counties; I feel sure of it.

6479. (*Mr. Cowan.*) I understand you to hold very strongly that the farmer's responsibility should cease as soon as the milk is out of his possession?—Certainly.

Mr. JAMES STRATTON, called; and Examined.

Mr. J. Stratton.

6480. (*Chairman.*) You come from Chilcombe, near Winchester?—Yes.

6481. And you are yourself a large producer of milk?—Yes.

6482. You have your own views as regards what the standard should be, and we shall be glad if you will kindly lay your views before the Committee?—I think we ought to have a fairly high standard for the sake of being protected against a mixture of separated milk, which is very damaging to our trade. I am not a chemist, and I hardly know what you call a high standard, but it ought not to be so high as to risk the incrimination of a man who is sending up pure milk and yet rather low. I think there ought to be some protection for the man who does not arrive at this high standard, but can prove that his milk has not been adulterated. I know a case where a producer of milk near London, who is also a retailer, was summoned for having adulterated milk. The quality was very low; but at great trouble and expense he proved that it had only been through the hands of servants who had been with him for thirty years, and who were most reliable men, and he did just get off. I think such a man ought always to be able to get off.

6483. Whatever quality of milk he puts on the market?—Yes, if he can prove there has been no roguery, but how that is to be compatible with a high standard I can hardly see. I think it is a very difficult subject.

6484. Have you many cows of your own?—About 200.

6485. Have you analysed their milk?—No.

6486. You have no conception yourself at the present time whether you are selling milk of a high standard or a low standard?—No, I do not know. I never get any complaint, although I use ordinary Shorthorn cows, which, I suppose, with the Ayrshire, give almost the lowest quality of milk.

6487. Do you sell your milk under contract?—A certain quantity.

6488. And under certain conditions—that is, you guarantee the whole produce of the cow, and so on?—Yes.

6489. Have you done this for a great number of years?—Yes, for twenty years.

6490. And you have never had any complaint?—No, not as to quality.

6491. Not as to quality?—I have had a complaint as to flavour every now and then.

6492. (*Mr. Barham.*) Are you sending to London?—Yes.

6493. (*Chairman.*) You are not prepared, from your want of knowledge from the chemical point of view, to say what the standard should be?—I should fancy it should be something like 3·20—I should fancy so, but I do not feel inclined to dogmatise upon that. It ought to be a highish standard—3·20 or 3·25 perhaps; but that is more a chemist's question than for me. I merely say it ought to be a highish standard, but what a high standard is I hardly know.

6494. Still, a chemist's question is a question of pounds, shillings, and pence, to persons who, like yourself and myself, have to sell milk?—Yes.

6495. If we produce milk of a high quality, and it is watered down to a low quality, we ought to get a higher price for it than we do?—Yes. We want to prevent this watering down.

6496. You come to say that you yourself are not afraid of a fairly high standard being fixed?—No, I should like a fairly high standard—I should think about 3·25, or something like that.

6497. (*Mr. Farmer.*) You sent milk the whole of the past year, I suppose, to London?—Yes.

6498. And you have had no complaints during the past year?—No, not as to richness.

6499. So that you may presume that your milk has been quite above the present standard, whatever it may be?—There is no present standard, is there?

6500. Not a legal standard, but there is a standard by which the analysts judge whether it is good or bad or adulterated or not?—I have had no suspicion of that sort with my milk.

6501. (*Mr. Barham.*) If you fix a high standard, you see yourself, of course, that it must bring under its lash, so to speak, all poor milks—milks like those which your friend sold; should you be satisfied, or would he be satisfied if, on appeal to the cow, he got off in the same way that he did on the previous occasion?—Yes, if he could depend upon getting off in that way.

6502. He would be satisfied to go through the ordeal in the event of his morning's milk being poor enough to bring him within that limit?—I think he must expect to submit to that.

6503. Do you think farmers generally would be prepared to submit to it?—Yes. If you have a suspicious article you must put up with the inconvenience of it.

6504. Only you see the article became suspicious under a standard which is said to be 2·75 or 3 per cent. of butter fat, and you are suggesting that the minimum standard now should be 3·25; of course, that would bring a much larger number of samples within that limit than was the case under the previous limit?—Yes. I think the trouble accruing to the farmer from that would be much less than the damage he now receives from competition with separated milk. I would rather go to the risk of that than have the risk we now run of having our prices reduced through weak milk being mixed.

6505. It is a choice of evils, and you prefer a high standard?—Yes. It is a choice of evils, and we must choose the least.

6506. (*Mr. Cowan.*) I understand you would allow the vendor to get free if he could show that his milk was genuine milk from the cow, even supposing it was below the standard?—Certainly. He would then have the odium of sending up bad milk, and he would very soon try and improve it by high food, or else his buyer would complain.

6507. Do you think it is fair to the consumer that he should be allowed to sell that milk and get off free of a penalty?—Yes, I think a consumer must put up with a low class milk as he must with a low class anything else. Let him go to the man who sells better, if he does not like it.

6508. The great body of the consumers do not know any thing about milk; that is the difficulty, and they must be protected?—As long as it is perfectly wholesome it does not matter about its being a little poorer; let him have a little more of it.

6509. You would not prevent that man selling his milk, even if it was below the standard, if it was proved to be genuine?—No, certainly not.

6510. Then you would encourage the improper feeding of his cows?—No, I should not, because he would not be encouraged in doing this.

6511. If this milk was accepted he would be?—If it was accepted once, and it continued to come bad, it would get a bad name, a bad character, and he would suffer.

6512. But if you allow him to get free in that way, he would never be brought up again you see. I do not see how you would get quit of that man. Do you not think it would be not just that a man who was feeding his cows improperly and putting the milk of those cows into the market should get off without a penalty if he was below the standard?—I think if his buyer would put up with it he can go on doing it, but his buyer would complain, and at the end of the year he would say I will not have your milk.

6513. Do you not think there is as much injury to the consumer—you must think of the consumer as well as the producer—in getting milk of that description, as if he was getting any quantity of separated milk. It comes to the same thing, does it not?—It comes to something

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like the same thing, but still one is a genuine article, and the other is an adulteration, fraudulently done.

6514. But in that sense, would you not consider that it was a fraudulent transaction when a man who knew there was a legal standard fixed, fed his cows in a very improper manner for the production of quantity irrespective of quality altogether, and yet from your way of talking he would get altogether free of penalty?—No. It would often happen through accident, bad weather, or poor pastures; it was so in this case.

6515. Do you think poor pastures produce a poor quality of milk?—Certain classes of pastures do, and the weather, too, affects the milk very much, and also the stage of your cows' milking. These cows, I believe, had calved about two months, which is, I think, the poorest period.

6516. What do you consider the poorest period?—I should say about two or three months after calving.

6517. Do you send the produce of the whole of your cows to London?—Yes.

6518. Then in your case, of course, you would have the cows calving at all periods of the year?—Yes, it would not affect me.

6519. It does not affect you?—That argument does not, but it might some people.

6520. Do you require to milk your cows at irregular intervals?—We milk them at regular hours, but not at very inconvenient hours. We have to milk beginning at five o'clock in the morning, and at about two o'clock in the afternoon.

6521. Those are regular hours of milking?—Yes.

6522. Have you found much difference between your morning's milk and your evening's milk?—In quantity and quality do you mean?

6523. In quality?—I have never noticed that.

6524. You have not got any of your milk analysed?—No.

6525. What class of cows may you have?—Common Shorthorns.

6526. You speak of the addition of separated milk, but have you had any experience of it in your own case?—No, I have never had anything to do with it, and have never seen it, but I know from report that it is very largely used in London.

6527. You do not know that it is as a fact?—I know it is done, that it is a fact.

6528. Added to full milk?—I should think they do it so; I do not know any other way, and I cannot imagine any other way of using it.

6529. It may be used for bakeries and condensed cream?—I mean mixed, I mean in an adulterating way.

6530. (*Dr. Voelcker.*) Though you may not have had your milk analysed, have you any knowledge as to whether the people to whom you send the milk have it tested?—Yes, I have heard of their having it tested, but I have never had a complaint.

6531. They have never complained about yours?—No.

6532. So, personally, whatever decision this Committee may come to you will not have any fear?—I do not know what the standard is now; I do not know what they expect.

6533. At all events, a man who conducts his business in the way that you do has nothing to fear with regard to the standard that may be fixed?—I think I may be subject to such accidents as I have spoken of as well as anyone else.

6534. You have been living under this chapter of accidents for a great many years?—Yes. I do not know how often they have tested my milk.

6535. But so far as your experience goes there is no reason why you should not live for many years happily under the same conditions?—If the future is like the past as to standard and so on.

6536. That is what I am coming to: you do not look with any apprehension upon a higher standard being possibly fixed than is believed to be at present in vogue?—I do not know; we are advocating a higher standard for the sake of protection against separated milk.

6537. You are advocating a higher standard for the sake of protecting yourself against those who are undermining your trade?—Yes.

6538. But you do not draw back from advocating a high standard because of any fear that you will come yourself within its penalties?—I think we would risk that; as far as I am concerned I would risk that.

6539. You mean to say that a farmer who does his business fairly and honestly has nought to fear?—I do not think it is a question of honesty, it is a question of whether it is worth your while to keep your cows better.

6540. Do you breed for quality in milking cows?—Quality of milk, do you mean?

6541. I mean do you breed good milking cows?—That is the object—to get a large quantity of milk.

6542. A large quantity of milk irrespective of quality?—Yes. We can arrange the quality by the food.

6543. Why do you not have Dutch cows?—I do not know much about them. I should think they are very large milkers of very poor quality, but I should think they are very bad graziers; that is to say, they would lose a lot of money when they come out to be fattened.

6544. Your reason for having the Shorthorns is because they are the best general cows?—Yes, they are the best milkers combined with the best grazing aptitude. Ayrshires are very good, but they are spiteful and difficult to keep in large herds; they are savage with each other, then they have very short teats, and they are difficult to milk. I think the milk ought to be tested where they do test milk when it gets to the farmer's railway station, not after it has been a 60 miles' journey, and we do not know what has happened to it. We do not know what may have happened to it on the railway; somebody may have abstracted milk and put water in. The farmer ought to be responsible to his railway station and no further.

6545. When you say that as long as you can prove that milk comes from the cow it should be allowed to pass, do I gather that you would say if you had a cow giving notoriously poor milk the public should be obliged to receive that and that alone?—Yes, I do not think I should make any difference.

6546. If a farmer had a whole dairy of such cows you would have to fix the standard according to them?—Yes, but it would be an utter impossibility—you are assuming an impossible case, or at any rate an improbable case.

6547. In a herd of 200 cows, what would your experience be as regards the inferior qualities of any number of those cows?—There would be no appreciable difference in them.

6548. Would you, as a good farmer—and we know the Stratton family all over the country as good farmers—throw out such a cow from your herd?—No, it is not a question of farming, it is a question of milk producing and of dairying. Of course, a cow with a little dash of the Jersey or Guernsey would give very rich milk—richer than an enormous milking cow of the Shorthorn breed. I have had a cow give 28 quarts a day, and another 32; I have no doubt their milk was very poor indeed, but if their milk were mixed with a few of these Jerseys or a little bit of the Guernseys it is qualified. In large herds of cattle you will not find extremely poor milk. I daresay you, if you kept one cow for yourself, you might get one of these extraordinary poor sort, but you would not get a farmer to get a hundred of them, and it would not be worth his while if he could.

6549. I put it to you as a practical man, is it likely to happen that if you had a cow giving a poor quality of milk that a churn as sent away by you would contain only the milk of that one cow?—No, it is quite absurd to suppose that.

6550. The milk of how many cows would probably go in your cans?—About 18.

6551. What size would they be?—They are 18 gallon churns.

6552. The fact that this milk, which was very large in quantity but perhaps might be poorer than others in quality, was in the ordinary course of events mixed with the milk of others, would lead you to feel no apprehension as to any difficulty arising from the sale of that milk?—No.

6553. Have you had any difficulties in times of drought?—Of what kind?

6554. With regard to the quality of the milk?—We have in quantity most decidedly, but I think the quality is rather higher.

6555. So you do not think it is necessary that we should fix the standard low so as to meet the case of any

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exceptional weather?—No, I do not think so. Has that been suggested?

6556. That has been suggested?—I think when the cows give a small quantity it is generally of a higher quality. If you have a wet time, and the grass is luscious and watery, then you get milk rather poor.

6557. That is when there is a rapid growth of grass?—Yes.

6558. But you do not think we need take very materially into consideration the fact that some pastures may be poorer than others?—No; they will not go in for that.

6559. We have been told here that some pastures produce milk with only 2·75 of butter fat?—That is an accident of feeding or something or other, it is not done by the intentional selection of cows.

6560. Then with regard to your knowledge of what takes place, what form of adulteration is the prevalent one?—The mischievous one is the separated milk.

6561. I rather gather from what you say that this only takes place after the milk has left the farmer?—I do not think many farmers do it.

6562. Are there many separators about you?—No, I do not think so, except those who really go in wholly for butter-making. There are such things.

6563. Is much cream sold about you?—Not very much. There is a good deal of butter made. I never knew a farmer in Hampshire send up mixed milk.

6564. By your complaint about there being the addition of separated milk to whole milk, and that you need to be protected from it, you do not imply that you need protection so much from your brother farmer?—No.

6565. But that the farmers as a whole feel that they do not get as good a price as they ought to because of the adulterations that go on after the milk has left them?—Yes; and if you look after the general public, their interests ought to be considered too; you are speaking in their interests, I presume?

6566. Without binding yourself to any particular figure, you do not think that if a standard were fixed at 3·2 of fat, you would have any cause to alter your ways?—That would not be very high, would it?

6567. I am afraid some of our friends think it would be very high?—I do not think that would hurt us.

6568. We have been told that the Ayrshire cows will not give more than 2·75 of fat?—They are not a rich milk producing animal; I should cross those with the common Shorthorn.

6569. Have you had any difficulty with regard to the transit of milk on the railway?—No.

6570. Do you send your cans open?—They are not locked.

6571. You send by the South-western?—Yes.

6572. (*Major Craigie.*) Can you tell us how many acres you are farming at the present time?—I am farming altogether about 6,000 acres.

6573. A very large area?—Yes.

6574. Is it chiefly grass land?—No, I should think it is about half and half.

6575. How are the 200 cows that you are speaking of fed?—They are all fed on newly-made pastures—pastures which were arable land 15 or 16 years ago. It is in Hampshire.

6576. What other feeding stuffs are you using chiefly?—In the summer they have only this grass, which is now very good grass indeed; in the winter they have oat straw and mangolds, and whatever feeding stuff is the most economical—generally either cotton cake or maize extract or both.

6577. (*Dr. Voelcker.*) Maize germ is it called?—No, maize extract, not germ; it is a different product.

6578. (*Major Craigie.*) Have you kept account of the average quantities of milk supplied from individual cows?—These cows we expect to average two gallons a day; we cannot always do it, but we think they ought to average two gallons a day.

6579. Have you made any particular inquiries as to the age to which you should keep the cows that are in milk?—That varies very much. A good cow, a cow that gives a large quantity, we keep as long as she will milk. They go out from not being in calf at all ages most irregularly.

6580. In giving the opinion that you have done to the Committee as to the comparatively high presumptive standard, you are speaking only your own individual opinion; can you give us at all the drift of opinion amongst other farmers and producers of milk in the Southern Counties whom you have had opportunities of meeting?—I have not got the opinion of any other farmers, but I think that the milk sellers in London, the wholesale sellers, would be rather afraid of a high standard. I think they would go a little below my views, fearing to be taken up, you know, for selling something not quite genuine.

6581. You are aware of the terms under which this Committee is considering the matter of a standard, and that the only suggestion is—under Section 4 of the Act—that the Board of Agriculture, if advised to that effect, may by regulation determine such standard as would raise a presumption until the contrary is proved that the milk is not genuine. It is not an absolute standard?—No, it is not.

6582. It gives the opportunity of defence; therefore on the milk falling below that standard the onus would be thrown upon the vendor of the milk?—I quite approve of that wording, and with that wording I should not be afraid of the standard I have suggested.

6583. As the standard will only raise a presumption, you are satisfied?—Yes, that is a saving clause.

Mr. W. H. Grigg, called; and Examined.

Mr. W. H. Grigg.

6584. (*Chairman.*) I believe you are the chairman of the Council of the Sanitary Inspectors' Association?—Yes.

6585. Have you had a meeting of your Association in connection with this particular matter?—Yes.

6586. I believe the views that you are going to lay before us are the views of your Association?—Yes. I have taken other means of getting the views of the members of the Association by correspondence since I have had notice to attend this Committee, and I think I have their opinions throughout the country.

6587. I take it that the views you are going to express are not so much directed to what a particular standard should be as to the means by which you and your brethren in the profession carry out the Act and the various methods by which they arrive at whatever standard may be fixed?—I was at a loss to know what we could do to assist this Committee, as it appears to be a Committee considering standards. I volunteered to come to give whatever evidence I can in connection with the practical working of the Act; but the nature of the evidence I do not quite know yet.

6588. I take it you are not going to speak at all as to what the particular standard for milk should be?—No.

6589. You are merely coming here to tell us what the existing methods are by which the samples of milk are taken throughout the country, and what you consider are the defects of the existing methods both in law and in practice; and you wish to tell us the means whereby you know the provisions of the Act can be defeated, and then you have some suggested remedies to make?—Yes.

6590. Perhaps you will kindly lay your evidence before us in that order; we shall be glad to hear you?—I propose first of all telling you a few of the details of the method of collecting samples, and some of the methods that are used for defeating the Acts, and some of the remedies I should like to see introduced into legislation which I think you are considering. Of course, the Acts are most generally dealt with by local authorities by neglecting them—that is what I find throughout the country; the replies are most various as to the measure of neglect that is evidenced all over the place. A good deal of the collection of samples is done by what I might be allowed to call pot-luck. There are officers whose duty it ought to be to collect samples, who have informed me from considerable urban districts throughout England that they have never received a request or requirement from their authority to collect a sample during an appointment lasting over about 15 years. I have a great

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deal of statistics, but those I shall not think of troubling you with. In the first place, it does seem to me that the Committees of local authorities do a great deal to hamper inspectors in connection with this work. I do not say that they do it designedly; I do not say that it is done for that purpose, but the effect of it is that the work is a good deal hampered by the action that is taken by the local authorities.

6591. (*Mr. Barham.*) Are you an inspector in London?—Yes.

6592. (*Chairman.*) I think you are travelling outside our reference. Perhaps you would direct your attention to the manner in which the samples are taken, when they are taken?—It is difficult to begin just there, because the object of the taking of the samples is to detect adulteration, and deal with it and to try to prevent it. If the inspector—I am taking it for granted that the inspector is a person who ought to be holding the position—is worthy to hold the position, then he ought to have a freer hand in the detection of adulteration than he gets when Committees control him in the manner I was about to explain.

6593. We wish to know from practical men how the samples are taken, and we will confine ourselves to that please?—In some cases—it is the case even in some districts in London, and it is very commonly the case in the country, a Committee is appointed who not only say what samples are to be taken, but they say where they are to be taken from, and the publication of the thing in this way apprises the people who are selling the commodities that we are going to take the samples, and accordingly the samples are prepared for us.

6594. For instance, the Committee in a district would give out that they were going to inspect whisky, we will say, and not milk?—Yes.

6595. And that would give the whisky people an opportunity of putting themselves right if they were wrong?—Yes, that is what I say; they publish it broadcast that samples are to be taken. That is very commonly the case. They also decide whether legal proceedings are to be taken or not, which it seems to me is entirely outside their power. Speaking of milk there are two ways of collecting samples and two places at which they can be collected—one in transit at the railway station and the other in the shops or on the vehicles by which the milk is wheeled through the streets. In collecting them in transit at the railway station, by the new Act we are required to send a portion to the consignor if his name appears on the vehicle containing the milk, or on anything else.

6596. You have done that since the 1st January?—This new Act has provided for it.

6597. It is being done?—Yes. In the other case we usually buy a pint of milk; you would rather me keep to milk?

6598. Yes, please?—We buy a pint of milk, and that is what the Somerset House authorities tell us we are to purchase. They say it is necessary for an analyst to have the third of a pint of milk for the purpose of analysis. I do not know why this should be, because I have bought a pennyworth of milk, and divided that into three, and have got a return showing the results of an analysis. The quantity we have to take is one of the greatest difficulties we have to deal with, because the people who are generally defrauded in this matter are the people in the very poor districts—the people who never think of buying a pint of milk. I know one or two cases of this sort. A very large retail dealer of milk—not in my district, so I am able to speak about it freely—I know keeps two qualities of milk in his vehicle, and unless it is a customer, or unless it is a small quantity that he is selling he always sells it out of a can that is provided for the purposes of sampling. I know that that is done on a regular system. I know, too, that in a shop they keep the milk not all exposed on the counter—it is served out of sight, and two qualities of milk are kept there; one of those is kept on purpose in expectation of the inspector arriving. I know that is done on a regular system. Then we use various bottles, but I suppose that is not particularly interesting to you?

6599. (*Dr. Voelcker.*) It is; that is just what we want?—I have got a whole lot of receptacles, from all over the country, and samples of their methods of sealing them. I thought it might be of some use. I may say there have been several of similar sorts sent to me, but I have only brought those that are dissimilar (*producing specimens of bottles, jars, tins, seals, &c.*).

6600. (*Major Craigie.*) Are these bottles used at the discretion of the inspector, or are they prescribed by the local authority?—I can hardly say that. The practice is very various I think.

6601. (*Dr. Voelcker.*) We only want those bottles which relate to milk?—All *those* are used for condensed milk.

6602. (*Mr. Barham.*) The inspector starts, does he, with the bottles already labelled?—Yes, when we go sampling we are provided with a whole paraphernalia—a whole lot of bottles, corks, seals, sealing wax, and tapers.

6603. The labels are on the bottles before you start; they are not put on as you go round, and make the purchase?—No, the labels are put on at first.

6604. (*Chairman.*) When you go sampling with all this paraphernalia, are you not a very evident inspector?—Yes, if you do it yourself, but we do not do the purchasing ourselves in the ordinary way. Of course, if we are taking a sample from the railway station in transit we do the whole thing ourselves—that is to say, except carrying the bag; but in purchasing at a shop we usually employ an agent.

6605. (*Dr. Voelcker.*) A female?—Sometimes, and if you knew the way we get rated by the magistrates for doing this sort of thing, you would be surprised that we do it as often as we do, because they appear to be very much against the employment of agents. I do not know why that should be or what earthly difference it would make.

6606. (*Chairman.*) Some people call them spies?—They are spies—I mean to say it is the only way that there is of detecting adulterators. Of course, it is not the just tradesman that we are trying to catch; it is the defrauder, and we have to deal with him in his own way. These samples show the seals used on the tops of the bottles. The same receptacle that would contain butter would be used for condensed milk; it is not that the jar is used in some districts for one thing and the box for another, but where they use the jars at all they generally use them for all purposes of fat or stuff that is rather too thick to pour into a bottle; that is just the difference to be drawn. Perhaps you would like me to describe how we act with an agent.

6607. (*Dr. Voelcker.*) Yes, do?—We give the agent definite instructions to go into a shop or to go up to a barrow or cart conveying milk, and to ask for "a pint of milk," and to say nothing else, but to pay the money demanded for it, which we hand to him or her as our agent; and then they bring the milk to us. Another difficulty that magistrates have raised in that matter has been that they say we ought to ask for "new milk." That is publishing ourselves, because in the ordinary way people do not ask for "new milk"; they ask for "milk"; but cases have been dismissed in the Courts, because the inspector or the agent asked for "milk," and did not say "new milk." Immediately we say "new milk," we give ourselves away. That is a thing in which I think there is an evident weak place in the new Act—that is to say, there is no definition of what milk is. There ought to be a definition of "milk," and "milk" should mean new milk with all its cream; it should mean what we call "new milk," and then you would give us a better opportunity of detecting the adulteration. When it is purchased the sample is handed to us in the jug—the jug also we provide; then I should go to the man and explain to him, as the Act requires, that I was an inspector under the Sale of Food and Drugs Act, and that I had purchased the article for the purpose of submitting it to the public analyst.

6608. You would come up then; you would be on the scene?—Yes, I would be on the scene then. The agent says nothing at all; he simply asks for the article, receives it, and hands it to me, and I say the rest. I make use of the words that I am required to by the Act, and divide the sample as nearly as I can guess into three equal parts. The bottles most commonly used are the ordinary 8oz. bottles. There are two or three objections to using them. One is that there is a little too much room in the bottle, which is only filled to about *here*, with a third of a pint, which leaves room for an accumulation of gas which frequently explodes the bottle—when cases are lost. A bottle ought to be of exactly the right size to contain the sample, and then it ought to be kept in a specific manner. When I have divided the sample into three parts I hand one to the seller, one I retain, and one I deliver to the public analyst.

6609. You seal them first?—Yes. Here are samples

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of some of the methods of sealing. A label is put on it with a definite number (the whole three are numbered the same), and I deliver one part to the analyst. I have had no instructions from the analyst of any kind as to the taking of samples or the delivery of them to him except that in the case of milk he must have it absolutely fresh. In all those cases in which I have had to deal with, analysts —and I have consulted every analyst that I have had an opportunity of speaking to upon the subject—every one of those analysts has told me that he would decline to sign a certificate of analysis for any sample of milk when it had turned sour. That is the only instruction I have ever had from an analyst—that he must have the milk when it is fresh. We take samples sometimes on a Sunday morning, and I have even had complaints in hot weather on taking it to him on the Monday. The third part, that is retained, is required by law to be kept absolutely under the control of the person taking the sample ; he has got to keep it under lock and key. There are several methods of doing that. In some cases it is kept locked in a desk ; in others it would be in a cupboard ; in others it is kept in a refrigerator. It appears that the only satisfactory way of keeping the third portion is in a refrigerator. In some cases where the analyst is, I think, another officer, and performs the analysis on the premises, we get a return in about two days, but in some cases it is a fortnight before the analyst gives his certificate, which leaves us a very small margin indeed for the taking of the necessary proceedings at the Court. Difficulties arise in consequence of the limitation of twenty-eight days where Petty Sessional Courts only sit, as they do in some even of the suburbs of London, once a month, because after fourteen days have elapsed before we get the analyst's certificate, you will see it only leaves fourteen days for the whole of the proceedings to be taken. Then if the person who has sold you the milk has—as he does sometimes—given you the address of somebody who does not exist, and you find the proceedings are all taken wrong, it gives you no opportunity of taking proceedings against the proper person. As a precaution against that I always in my case—and I think others do the same—summon both the people who are liable—that is, the person who actually hands it to me and the person who, I am told, is the owner—they are both equally liable under the Act, so I always summon the two, and if I get one conviction the other summons is withdrawn. I think that would be a good practice if it was required to be carried out. All samples are now compulsorily divided. I do not know that there is anything further I could say in connection with these samples excepting that when we go to the Court in an adulteration case, we take this sample of milk which is about from a month to six weeks old, and the milk seller, if he knows his own interest, requires the third part to be sent to Somerset House. Of course, the difficulty is going to be very much greater with us now, because the certificate of the private analyst who analyses the portion that we have left with the seller is to have equal weight in the Court with that of the public analyst. There would probably be a discrepancy between them, and the third part would be sent to Somerset House, whose decision might differ from both the others, and that is the one that is generally upheld. In a case of doubt of that sort if there is a real doubt, of course, the person who sold the milk ought to have the benefit of it, and he always gets it ; it is a very sore place with us—this appeal to Somerset House under the present circumstances. But that is in the Act, and it will, I suppose, have to be put up with until the Act is altered. I think if a person intends to have the third portion sent to Somerset House, he ought to give the inspector notice immediately, and that he ought not to wait until the appearance in the Court. He would in some cases save two or three weeks, because we have to give fourteen days' clear notice between the service of the summons and the hearing of the summons now. That is an extension of seven days on the old plan. I have never in all my experience—and I have never been able to find anyone who has—heard the point raised that the seven days' interval between the service and the hearing was insufficient ; and why that fourteen days' notice has been put into the Act we are unable to understand. I do not know who introduced it or why it has been put there at all, because I have never heard any reason given for it, and I have never been able to find anyone who said seven days was not long enough. There is another objection, too—not so much in the matter of milk as in the matter of other things that are used ; and that is in the using of the cork. In the instructions issued by the Somerset House authorities we are required to use sound corks for the bottles. Now there have been most peculiar decisions of analysts—that is to say, discrepancies between the analysis of the public analyst and the analysis of the part which has been left with the seller, which can only be explained by the sample having been tampered with before it was sent to the analyst. I think that that is a thing which under this new Act some very special provision will have to be made to prevent. Corks are easily boreable, and I believe—I have never seen it done, but I have been told by an analyst that he could do it quite easily—that the cork can be bored, a hypodermic syringe inserted, and all sorts of pranks can be played with the contents through the cork.

6610. (*Chairman.*) Through the cork and the seal ?—Here is an instance (*producing sample*). The seals are very various, some are very small and very indistinct ; there is very little distinctive mark about that. This I think is about the worst sample of the whole lot from the point of view I was just going to mention. Although there are two seals on it, making it rather difficult to remove the cork, there is a very large space of cork there which could be bored, and all sorts of things could be done with it without damaging the seals in any way. It would be very easy to bore through a cork stopper, and either there ought to be some special bottle for the purpose, or the bottle ought to be, as in some cases it is not, enclosed in a bag, it is sealed in the way that you see that one sealed. It ought to be enclosed in a bag like this to be of any use at all, or to prevent interference with the cork.

6611. (*Mr. Cowan.*) Would a glass stopper not do if it were sealed over ?—There is a metal one here. Another method has been adopted with that. Then it ought to be a stout bottle. This (*producing sample*) is the best bottle of the whole lot for sampling, because it would be hardly possible to burst that with the decomposition of the milk. The stopper ought to be of impervious material, and the seal ought to be of a specific size so as to cover the whole space of the top, otherwise it could be withdrawn. Something of that I believe urgently requires to be attended to. Then there are two methods of delivering samples to the analyst. In London we usually deliver them personally, because the analyst does not live very far off. The other method is to send it by parcels post under the regulations of the Post Office. Another thing I should like to speak about in this connection is the warranty. The warranty is going to be the greatest difficulty that we shall have to deal with, I think, because now an invoice is a warranty ; hitherto it was not so. It ought to be a specific warranty. Invoices are warranties, and we shall always be met with a warranty defence I think. That is the one thing that is making it urgent, or important in my mind, that some regulation should be made which will make it impossible to tamper with the portion of the sample that is left with the seller. That is a most urgent thing. If a thin metal thing is heated and run between the sealing-wax and the neck of the bottle the whole bottle could be broken away and the sample destroyed, and the cork could be very easily put down into another bottle. That is the sort of thing we shall have to do something to guard against. Only one of the bottles I have here has any special mark upon it ; it is specially made and cast with the name of the authority on it. I do not think even that that would be an absolute security, because the adulterator would save his old bottles when his sample turns out to be good. That is a difficulty I foresee, but I do not know what the remedy is, and I cannot see what we are going to do in order to deal with it. I mean to say that I am not in a position to recommend anything, and I do not know what to do.

6612. (*Major Craigie.*) May we take it that your opinion is that some rule should be laid down on that point by a central authority so as to prevent these differences of practice between local authorities ?—Yes. I think some regulation will have to be made.

6613. You say that on behalf of the inspectors, for whom you are speaking here, you would welcome a general regulation of the method of taking the samples ?—Yes.

6614. Either by circular from a body like the Local Government Board, or from the Board of Agriculture in this particular case of milk, or would you prefer to leave it to the local authority to decide ?—I do not think so, because these samples I have shown you are presumably all decisions of the local authority.

6615. That was suggested to me by your putting this

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forward; your evidence tends to having a regulation for the method of sampling?—Yes.

6616. Just as is done in the case of samples taken by the Customs?—I think it is necessary.

6617. (*Mr. Cowan.*) I did not quite understand what you meant by getting round the cork and substituting another bottle?—The only place that could be interfered with at all by breaking the bottle would be just this bit that is stuck on to the glass itself; it would be very easy indeed to run a bit of metal round here to loosen it from the actual glass, and then to break the glass away, and remove the cork.

6618. (*Dr. Voelcker.*) And put the cork into another bottle?—Yes, I see no difficulty at all about it. That is the sort of thing that is going to be done. I have proved to my own satisfaction that the cork has been treated so in dealing with other things, although perhaps I ought not to go into that. The bursting of the bottles is quite unnecessary if stout bottles of this sort were required to be used. Now as to a few of the ways in which I have found the Food and Drugs Act defeated. The vendors of the milk in the streets carry these duplicate cans that I have spoken to you about. They serve regular customers with, I think, a poor quality of milk, perhaps a milk that would not pass muster. I have tried, and I know that others have tried to get the customers into league to make purchases for me, and I have never succeeded yet. They always seem to take up the side of the milkman, and to regard the inspector as a spy. If the customers will not do it as our agents, and if the milkmen leave it in a can or some receptacle, as it always is left outside the house, then the sample would not be legally taken, and we could not use it for the purposes of analysis; I mean to say we could not get a conviction if it turned out to be adulterated, because we had not purchased it in the proper way.

6619. (*Mr. Barham.*) Could you not in that case take it in the course of delivery?—No, I do not think that would be taken in the course of delivery. I believe the course of delivery means the course of delivery from the wholesale dealer to the retail dealer, and it speaks, I think, of a railway station in that section of the Act. I do not think that the words "taken in course of delivery" would apply at all in that case. That is our view of it.

6620. (*Major Craigie.*) Do you contend that the place of delivery is confined to a railway station?—No, but we do not think that the place of delivery means from the retailer to his customer.

6621. Would not the course of delivery be anything that came into the actual possession of the consumer, and was passed over his door?—Of course it is rather a fine question that I should think would require a legal gentleman to answer. I should not like to say, but it appears to us that that would not be.

6622. (*Dr. Voelcker.*) You would not act in that way?—No. We do take samples in the course of delivery at other than railway stations, because I have it in my mind that we go to large institutes, such as the workhouses or the infirmaries, and when the wholesale dealer who supplies them by contract brings his churns there, we take samples, and we report them as being taken in course of delivery. But we do not think we should be able to proceed if we took the milk from a doorstep as a sample in course of delivery. That is our present view of it at any rate.

6623. (*Mr. Farmer.*) What is the difference? Is it in the size of the churn, so that you can take it from a large churn going to the workhouse, but not from a small one?—That is what I think. It is being served in that case in wholesale quantities by contract, it is not served by a retail milk seller to the large institutions, but is sent directly to them as a wholesale transaction. We regard that as in the course of delivery. There are two ways in which it is taken to the place of delivery. In the case of the milkman, the milk vendor, it is usually taken at the station, and we say that it comes into his possession immediately on his taking it away from the railway; we say that that is where it gets into his hands. While it is in the railway station it belongs to the farmer, but when it gets into the possession of the other man it belongs to the retailer. In the case of a large institution such as I am speaking about, the place of delivery is not the railway station at all, because the farmer, or the wholesale dealer still retains possession of it, and by his cart delivers it at the large institution doors. That we say is the place of delivery in that case—not the railway station, and it would be in course of delivery.

6624. (*Dr. Voelcker.*) Have you been up to now in the habit of taking only one sample in such cases, and not dividing the sample?—Up to this year, yes. I have never taken one under the new Act. There always used to be only a single sample taken.

6625. When you have taken samples that have been in course of delivery to workhouses and other institutions, have you been in the habit of taking only one sample?—No, I have always offered to the person who sold it to me—he did sell it to me, for I have asked for it, and tendered him the money when I have taken it at these institutions—I have always offered to divide it, and give him a part if he was willing to take it.

6626. But you are aware that you have not been obliged to do so?—I believe that is so. At the railway station, when you get it from a churn, it is in the possession of the railway company practically; you have to go to a porter or whoever is in possession of the thing, and you can hardly hand back a portion of the milk to him as being the vendor. In the other case there is the agent of the owner in actual possession of the milk, and if he gives you a sample, and there is no difficulty about it, we do it for safety's sake, because there is nothing to say you shall not divide it.

6627. (*Mr. Farmer.*) You say it belongs to the farmer so long as it remains in the station, and it does not belong to the retailer or the wholesale man until it leaves the station?—Yes.

6628. But the wholesale man leaves the milk on the station sometimes for a considerable time?—I do not know of a case of that sort.

6629. For twenty-four hours sometimes?—I consider it is in the possession of the farmer.

6630. He deals with it there, buys it there, sells it there, mixes it there, measures it there, does everything to it there?—If he do so he has taken possession of it.

6631. The wholesale man at the station has?—I do not quite understand what you ask me.

6632. You say that you regard the milk as belonging to the farmer so long as it remains in the station?—That is not exactly what I mean. I mean until the railway company's servants have given it over to the person that it is consigned to.

6633. That is another matter altogether?—That is what I mean, because I have it in my mind that the cart drives up to the station, and simply takes the milk away, and does not remain there at all.

6634. I suppose you would reckon that within a quarter of an hour after the train had got it in it had left the hands of the railway people?—No, I should not; that is the usual practice, but I should say, unless the consignee had actually received it, and had taken possession of it, it was still in the possession of the farmer.

6635. But he helps you to get it out of the railway van, and takes possession of it directly it gets there, rolls it aside, and puts it on his own milk vans?—If he has taken possession of it, I should say that it belongs to him.

6636. That is within five minutes after—in fact, it is on the arrival of the train?—Yes. The line appears to me to be very clear. I should say that I should undoubtedly regard it as belonging to the farmer until the person to whom it was consigned had taken possession of it, and if he had taken possession of it I should consider the farmer had done with it.

6637. When would you say that he had taken possession of it—that is the thing?—When he had received it from the agent of the company. If he had taken it out of the van himself, and stood it somewhere for his own convenience, I should certainly consider that it was in his possession.

6638. (*Mr. Barham.*) Are you speaking of Paddington Station particularly?—I am not speaking of any station in particular; I am speaking of the general way, and I am bound to speak in that way, because in my own district there is only one small station to which very little milk is brought.

6639. The practice is so various; in a great many cases the railway people unload, and in other cases sometimes the consignee's man assists in the unloading?—I should think that is a thing that one would have to deal with on its merits; you could not make an absolute rule.

6640. (*Mr. Farmer.*) I thought you did make an abso-

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lute rule by saying as long as it remained on the station it was the farmer's?—I did not mean that.

6641. (*Dr. Voelcker.*) Under the new Act the practice would be uniform so far as sampling went?—Yes, with the difference that it is only when the consignor's name is to be found on the receptacle that he is entitled to the portion being sent to him. The practice would be just as it always was if his name did not appear on the receptacle.

6642. (*Mr. Farmer.*) What is your practice of taking a sample of a farmers' consignment? Supposing a farmer sends up, we will say, ten churns of milk to any particular London station, that is one sale and one consignment; how do you sample that one sale?—We take a sample out of any one of the churns.

6643. That is not a sample of his consignment, is it?—Yes, you see that is ten consignments, and it would be a separate offence if a bad sample was taken from each of those cans, and it would be separately punishable.

6644. How would you take it from that separate can?—The practice is that where a great deal of it is done the inspectors provide themselves with an instrument for mixing the milk up or stirring it up. Where they take it at a farm, it is, I think, done still differently.

6645. I wish to deal with it at the delivery station first of all?—At the station any inspector who took a sample of milk would thoroughly stir the milk up before he took the sample out.

6646. Would he stir it up with a stirrer?—Yes, he would.

6647. Do you think he can effectually mix it like that?—I never heard of a complaint that it was not properly mixed.

6648. I should complain of it strongly?—That is the only means I know of being used, and I think it is thoroughly stirred. Then he puts the dipper in from the top, and he takes it out of the head of the can, but he does not take the top lot. He has a dipper with a handle that perhaps goes a third of the way down the churn, so he does not take the top layer. He stirs the cream in as much as he can, and he takes it about a third of the distance down the can.

6649. (*Dr. Voelcker.*) You have not brought a stirrer in your bag, have you?—No, I thought I had got a good bagful.

6650. (*Chairman.*) We have had it in evidence that the practice was to take the churn that was to be inspected, to empty it into another can of a similar size, I presume, and then to turn it back into the first churn, and that after its second or return journey it was sampled, having thus been thoroughly mixed; do you never do that?—Never, and I have never had an opportunity of doing it. To do that you would require an empty churn always with you; and that added to the present paraphernalia would hardly be convenient.

6651. It is done in Birmingham?—They would do it on a system there, because there is an immense amount of milk received within a very small area there. The Birmingham stations are all together, and they could make provision for it. But in London we do not as far as I know make any provision of that sort, because we are not entitled to go out of our own district. For instance, a farmer consigns milk to a vendor who lives, we will say, in Chelsea, and the retailer in Chelsea has some suspicion of this milk, and he would like a sample taken while it is in the possession of the farmer—having had his own analysed perhaps. I have had instances of that sort. Now, the Inspector of Chelsea cannot go to the consignor's delivery station when he sends it to Paddington, say, for that station is out of his own district, and he has no right to go there, and cannot go there and demand a sample. Consequently the retailer in Chelsea would have to go to the Paddington Inspector—an officer in another district altogether, and a person upon whom he had no claim—and ask him to sample a consignment of milk that was consigned to him in Chelsea, because immediately on his receiving it at Paddington Station he becomes responsible for it, and a sample may be taken from him, by either the Paddington or Chelsea inspector, or in any parish through which he conveys it, en route. That is a thing I asked the Committee on the Food and Drugs Bill to alter in the law. They have not done it. My suggestion was to give an Inspector authority to go outside his district to a station to which milk had been consigned belonging to a retailer in his district; but he cannot do that, as no alteration has been made in the law. Another way in which the Act is defeated is by the duplication of cans. I am very strongly of opinion that every one of the receptacles containing milk, or separated milk, or skimmed milk, should be legibly marked, should have a distinctive mark on it as to what it contains, in just the same way as separated or skimmed milk when it is condensed is required to be marked; that is required to be marked, but the other is not required to be marked, and I think that it ought to be. I should like to provide that the two kinds of milk—separated milk and new milk—should not be sold from the same receptacle, the same barrow. Unless you do that we can be very easily tricked. I think there ought to be an absolute separation for sale purposes of separated milk and new milk.

6652. (*Mr. Farmer.*) We have had it in evidence here that it is extremely difficult for the farmer at the farm to mix his milk properly, and that therefore one churn may be very much richer than another churn, and one very much poorer than another; why do you say that a farmer who sends up two, three, or half-a-dozen churns sends up so many different consignments; they are only one sale, and what is the authority for your saying that they are really more?—I am only saying that from the legal point of view; the law says that.

6653. Does it?—Yes.

6654. Can you tell us where?—I cannot quote you the case, because I did not think you would require such evidence; but I shall be very pleased to let you know what the case is. There is a decided Queen's Bench case on the subject.

6655. That throws the obligation on the farmer of thoroughly mixing his milk?—Certainly, or of sending it all pure.

6656. Why is it not pure if one can has got the cream belonging to the other?—I only know anything about it from the legal point of view, and I should certainly regard it, if they were all impure, or any number of them, that the contents of each churn would constitute a separate offence, and he would be liable separately in each case, and if there were 10 churns there might be 10 penalties.

6657. (*Dr. Voelcker.*) There can be no question about it; it is a separate offence in each case, is it not?—Yes, there is no doubt about that; each case is separately punishable. There is a Queen's Bench case on the very point.

6658. (*Chairman.*) Will you continue, please?—As to the quantities of milk, it would be a very great assistance to us in the detection of these fraudulent practices if the Somerset House people would be content with a smaller amount. Their regulation requires us to send them a third of a pint of milk, which requires that we should buy a pint, because if you do not send them a third of a pint they would send back and say it was insufficient for their purpose. So that we have to take this quantity. But our analyst has given results on a pennyworth of milk. In another district the analyst gives a result on a third of a halfpennyworth of milk, and if one analyst can do it, and is willing to put his name to the certificate, surely the authorities of Somerset House could let us off with rather a smaller quantity than a pint. This question of quantities is a most important thing to us.

6659. (*Dr. Voelcker.*) In dealing with the farmer?—There is not much difficulty about the farmer; we always take what we want then. But in this case of the retail dealers there are districts in London with thousands of shops where they never sell such a thing as a pint of milk to an ordinary customer. Those are the people who are selling adulterated milk with impunity, because if we catch them they have the third portion sent to Somerset House, and if they know their own interest they would always do that. The proportions of adulteration by the addition of water, and by the abstraction of fat, which are really the only two that we know, are, I think, more than 2 to 1; the proportion is as about 5 to 2 in favour of the addition of water.

6660. (*Chairman.*) Do you mean to say that in seven cases of adulteration five are of water?—Yes, I think that is about the proportion. That is founded on information that I have got from all over the country.

6661. Is that in cases of conviction?—Yes, in cases of conviction. Another thing which gives us a very great difficulty in applying the Act is the manipulation of Section 6 and Section 9, the one dealing with the abstraction of fat and the other with the addition of water.

6662. (*Mr. Barham.*) Is that the old Act or the new Act you are referring to?—It has not been altered. The one provides for the declaration of having abstracted

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fat, and the other deals with selling to the prejudice of the purchaser. There was a case I should like to refer to here that has been settled in the police court; it is the only one on the point I ever heard of. In purchasing skimmed milk we have that sometimes, because what we find then is the addition of water, and skimmed milk should have no added water—it is only the fat that has been abstracted; but when we get water added to skim milk we always get a conviction for the addition of water. Some little time ago we got some milk. A pint of milk was asked for. The person said it was skim milk. "Very well," said the Inspector, "I will have skim milk." When the analyst's certificate was returned it certified that it was about half water and half new milk, and that it was not skim milk at all. The seller was summoned for selling to the prejudice of the purchaser. The case was dismissed, and the magistrate held that inasmuch as in the half that was milk the purchaser had had the value of the money that he had paid for it, that the seller had given him the water, and that it was not sold to the prejudice of the purchaser. The case was dismissed on that ground solely that it was not to his prejudice, because he had had value for his money. The other thing that we find the very greatest difficulty about is the ridiculous fines that are imposed for adulteration. It is a complaint all over the country that the fines are no deterrent at all to adulterators. Unless something is done to increase the fines—it would be perhaps unfair to fix a minimum fine——

6663. (*Chairman.*) I do not think that it is within the competence of this Committee to go into that point?—Very good. The things that I think require amendment in practice are—the regulation of these bottles, that they should have impervious stoppers, and that the seal should have on it the name of the authority, and should be an official seal. Some of those seals which you have got samples of have simply an initial on. Perhaps there would be no difficulty at all in getting a duplicate of such a seal if it was worth a person's while to do it. That is the sort of thing that will have to be guarded against. There ought to be some authoritative seal, and the seal ought to be the actual size of the neck of the bottle, so that it covers over the whole of the space, as if it leaves a margin it leaves opportunities for tampering with the sample. Then milk vendors should not be allowed to have two kinds of milk on the one barrow. I did succeed in getting the Committee to insert in their new Bill that the name of the vendor should be on the receptacle. That is a very considerable help to us, but it is not complete, as it allows the actual vessels containing the milk to be unmarked. We take it that the receptacle by which it is being conveyed means the barrow or the truck. There has been no case on the point yet and whether that section in the Act means that every can containing different kinds of milk should be labelled, is a legal question that I do not feel disposed to deal with, but so far as we have been able to find out those words are not intended to apply to that case.

6664. (*Major Craigie.*) May I ask which section of the Act you are referring to?—It is Section 9. That appears to refer to the conveyance in which it is being delivered, I take it, and not to the actual receptacles. Then when the defendant intends having the third portion sent to Somerset House, I think the time ought to be altered in which he is to require it to be sent.

6665. Is that prescribed under the Act now?—No, but he can require it when he gets to the Police Court, and the milk has become about five weeks old, when he tells us that he wants the third portion sent to Somerset House, and then it is in a very advanced stage of decomposition. Then the Somerset House certificate, if there is any discrepancy between the other two, is allowed to be as it were the decision of an appeal tribunal; it is the Somerset House certificate which is adopted, and yet the Somerset House authorities do not get this portion as I say until it is in a very advanced stage of decomposition. That is a very sore thing with the analysts; they require us to take it to them the same day or at the latest the day afterwards; and they are very much put out about this.

6666. (*Chairman.*) If Professor Thorpe were here, I think he would tell you that he would just as soon do it with sour milk as with new milk?—He would tell me that with impunity, but he would not care to tell that to a body of analysts. My own idea about milk is that there ought to be a special means of dealing with the analysis of it. I do not think that there is any satisfactory way of dealing with this matter that has occurred to me, except that the Somerset House authorities should have the analysing of all the samples of milk. I do not mean to say that it should go to what we know to be Somerset House now, but that it should be done by a Government Department with Government authority, and that the certificate on which the court is going to rely should be a certificate taken under absolutely fair conditions. I think it ought to be a certificate on a fresh sample of milk about which there ought to be no cavilling, and there ought to be no appeal from it. That is the one thing which I think would meet the case, and it is the only thing that has ever occurred to me—that it will have to go directly to the Government authority, and that there should be no appeal against it. Another thing that requires to be amended is the alteration of the limit of seven days to 14. The alteration from the seven days between the service of the summons and the hearing is an of seven days to 14. The alteration from the seven days it has now been altered to 14, and it makes the thing most difficult to carry out. I do not think that the alteration was necessary, and I have never met anyone who was able to give me the reason why it had been done. Another difficulty in dealing with milk and other things is the service of the summons. There is a provision in other Acts that the service of the summons on the premises where the offence is committed is a proper service; but it is not so in this case. The very greatest difficulty arises sometimes in finding out the person to serve the summons on, if, for instance, it is a limited company.

6667. I do not know whether it is within our reference?—I do not think I have anything else I should like to tender.

6668. (*Mr. Murphy.*) Taking the conveyance of milk, say, from the farm to the retail shop in the town, is the railway station the only place where the inspector has to help himself to a sample of milk?—I do not think so; I should think anywhere in the course of delivery. I should take it that I was perfectly justified in taking a sample at any point of transit if in my district.

6669. The milk, except at the railway station, I understand, is under the care or in the charge of an agent of the owner?—Yes; it is regarded as being in the owner's possession until the consignee receives it.

6670. At the railway station there is an interval when the sample of milk is being taken, and when there is nobody to represent the owner at the moment?—No.

6671. And at that time the inspector has to help himself?—Yes.

6672. Therefore, the precautions that are taken to get a fair sample are entirely dependent upon the action of the inspector?—Yes.

6673. At all other times the precautions taken to get a fair sample are dependent on the action of somebody who represents the owner?—Yes.

6674. I am right so far?—Yes.

6675. Have the sanitary inspectors who collect the samples ever considered what precautions should be taken by them in the collection of a sample of milk so as to ensure getting a fair sample?—No; I think the practice is generally to consult with the analyst as to how they should proceed in a matter of this sort. I think it is one of the things on which an analyst would be best able to advise us, and I think that, the practice being so different in different places, it is a thing about which you could not make a rule, and that they must be guided by the circumstances.

6676. But the Association of Sanitary Inspectors has never asked the Society of Public Analysts as to what would be the proper course to adopt?—No.

6677. Do you know of any instances in which the defence has been that the sample has been unfairly taken, that is, that due precautions have not been observed to ensure its being a fair sample?—No, I do not. I have known of cases where it has been taken from a counter, and the defence has been raised that in consequence of the top of the milk being sold, or of there only being a little of the milk left in the bottom of the receptacle it was poor; but that is a defence which never has any effect on the court in my experience, because it is the duty of the person who is selling it to keep it mixed. Indeed they generally do it—it is very seldom that you take a sample of milk from a counter where the person does not mix it. We cannot ask them to do it, because we put ourselves as far as we possibly can in the position of an ordinary purchaser.

6678. Does it occur to you that it would be an advantage if regulations were made by some responsible authority as to how a sample should be taken at the railway station; that is to say as to the milk being properly mixed before a sample is taken from the churn, and so on?—Yes. Of course we would be only too pleased to have any regulation made that would appear to be more effectual than the manner in which it is done now; but the difficulty appears to me to be to evolve a practicable scheme that will apply to all the country, as for instance in Birmingham, or a large urban authority of that sort, where the Local Government is concentrated, and where there is only one set of inspectors, and only one set of railway stations probably—they are generally all together. They can make arrangements by which they can have a place near where they may keep a churn; and if it was held that changing it from one churn to another a few times would thoroughly mix it it would be practicable in their case, but in my case it would not.

6679. The usual practice is, I understand, simply to stir the milk?—Yes.

6680. Is that stirring done with a measure?—No. There are several kinds used. One is something like a small flail, or a small boat-oar—but it is perforated. It is perhaps 6 inches wide at the bottom end, and there is a handle at the top. It is almost as long as the can is deep. The thing is put in and the milk is thoroughly stirred up from top to bottom.

6681. (*Mr. Farmer.*) Do you think that in that way you can send the cream to the bottom of the can?—That is how it is done.

6682. (*Dr. Voelcker.*) Does the inspector carry it about like a walking stick or up his back?—He does not carry that when taking ordinary samples. If a person is going to get a sample of milk at a railway station he makes up his mind some time beforehand, and he makes all his preparations, and that is generally the only sample he takes on that journey.

6683. Then everybody knows it beforehand?—It does not matter if they do when it is at the railway station, because there is no one in charge of the milk, and they cannot screen it, because he goes to the railway station and helps himself.

6684. They know he is about the place?—They cannot help it; I do not see that there is any difficulty about that.

6685. (*Mr. Farmer.*) The owner of the milk—the person in possession of the milk — may be 50 miles away?—There is never any difficulty about that.

6686. (*Mr. Murphy.*) How does he get the milk out of the churn?—He has a measure—a dipper we call it—with a handle to it about eighteen inches long—perhaps more than that—and a hook at the end of it; and he dips this about a third or half way down into the milk, and he draws it up full, and fills his jug with it.

6687. What is the result of that; does not this measure get filled with milk from the surface as it goes below the surface?—Yes.

6688. And is that not carried down into the lower depth of the milk, and then brought up again; is it not generally milk from the surface that he gets—at least in considerable proportion?—It might be so if he very gently and carefully lowered it, and then very carefully raised it, but he does not do that—he gets the thing into the milk, and gives it a stir in the can.

6689. So as to empty out of his receptacle what he has carried down in it?—So far as possible; he will take the thing and stir the milk about with it again, and probably the contents of the thing are changed two or three times while it is down in the milk.

6690. Do you think, as a matter of fact, that the inspectors do take these precautions?—I believe, as a matter of fact, they do. They volunteered the statement to me in perhaps a hundred cases out of those who have answered that part of my queries; in every one of those cases they tell me that it is their invariable practice to stir the milk. They volunteered it to me; if it was not their practice they would say nothing about it.

6691. That is information which has come to you from inspectors not only in London but all over the country?—Yes.

6692. You have no suggestion to make of any better method of dealing with this milk?—No, and in my own experience I have never heard of a complaint in court; I never knew a case in court where the seller raised the question of its not being properly mixed.

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6693. How large is the dipper?—It holds about half a pint, or less than half a pint.

6694. So that for the purpose of getting the pint that you require it has to go in twice?—Yes.

6695. (*Mr. Cowan.*) Do the inspectors always wish to take a fair sample do you think?—I think so. What other object can they have?

6696. They get the credit with a great many of the public for wishing always to try for a conviction?—I am afraid that one is bound to admit—and I am sorry to be bound to admit—that there may be such inspectors; I do not know any, but there may be, who are rather avaricious for convictions, and who may do an unfair thing; but I am certain that cannot be taken as a rule.

6697. You say the purchaser of the milk, that is, the consumer, almost always refuses to be an accesory with the inspector?—Yes.

6698. That looks as if they were suspicious of the inspector being wishful for a conviction?—That is a matter of inference. I am perfectly certain that the people who get punished, that is, those who suffer most from these fraudulent practices, particularly by large firms—and no firms are too large for it, because there have been convictions of very big people—the people who get the indifferent stuff are the people who are regular customers, and who have their goods delivered to them on the premises; I do not mean only in milk, but in everything nearly.

6699. Do you think it is fair to the small retailer that a sample should be taken from the very bottom of his tin full of milk—a small retailer is bound to be putting it out possibly in halfpennyworth?—Yes.

6700. He is taking it out always; he does stir it round and take it from the top, but when the inspector goes to him at the end he is bound to get very poor milk, and the retailer cannot prevent the milk from being very poor then?—Yes.

6701. Should the inspector try to do the retailer justice by taking the sample at a proper time?—No, I do not think that. I think that the inspector tries to put himself absolutely in the position of an ordinary purchaser; and if the inspector does not get the bad milk somebody will get it.

6702. At the bottom of the can; it is bound to be bad, is it not?—Not necessarily; we do not find that to be so. They have raised that point once or twice; but I think they take so much care to mix it, and to keep on mixing it, and stirring it, that it rests but a very short time. I think it is not our experience that it is bad milk at the bottom, indeed in London the reverse is the case. The greatest quantity of milk sold retail is from hand-carts in the streets. These carry a churn which is invariably fitted with a tap near the bottom, so that the milk with the most cream is the last drawn.

6703. From information that I have had—and consider to be very reliable information, too—it is held to be an utter impossibility to keep the milk up to the quality that was begun with, in the case of the small retailers who have to put it out in halfpennyworths; and the inspector very often goes and gets the last of it when it is considered to be very much poorer than it is at the top. What do you say to that?—If the inspector did it designedly, I should think it is an unfair thing to do.

6704. That is exactly what I mean; you think it would not be fair for an inspector to take sample in that way?—I do not think it is a proper thing for an inspector to be guilty of any trick at all. He ought to be fair in what he does. I do not think that he should pick his time; I never did, and I never heard of any other inspector doing it. He goes in the ordinary way. He takes samples of milk the whole of the day; he gets the first from somebody, and the last from somebody else. One does not pick it. I do not believe inspectors do that designedly. They have not interest enough to do that sort of thing. I should be perfectly ashamed of anybody doing it if I knew, and too ashamed to do it myself. If you are collecting samples the whole day, you must go to somebody first and somebody last. What you do is, you go in when and as ordinary customers are going in, and the ordinary customers are buying this as genuine milk from the time it is full till the time it is empty.

6705. (*Dr. Voelcker.*) You have had different meetings of your association at which you have discussed these different points, have you not?—Yes.

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6706. And papers are read from time to time on these very questions?—Yes.

6707. Has the effect of these meetings and discussions been such as to produce more uniformity of action by inspectors through the country?—I think so, because the discussions are always fully published, and sent to the Press all over the country. I have no doubt it has that effect.

6708. Naturally it would tend to the adoption of the practices which had recommended themselves?—Yes, and it does.

6709. Of course, we all know that at first action was very loose with regard to the taking of samples?—Yes.

6710. But, on the whole, you would consider it very much improved now?—Yes, I think so.

6711. Do you as a body or as individuals ever make representations to your authorities as to the way in which samples might be taken, and as to uniformity of practice with regard to it?—No.

6712. It is left entirely to the inspectors?—No, there are committees of the authorities who are appointed to deal with the samples to be taken, and so on, as I have explained; but as to the method of doing it I have never heard of any discussion taking place by the local authorities. They simply regard it almost as an unnecessary duty.

6713. Do your public analysts ever advise you?—No, unless one asks. The only thing I ever heard from an analyst was that the milk must be fresh.

6714. Do you not know, as a fact, that analysts are very often in the habit of speaking to their inspectors as to the way in which they should take and seal samples?—No.

6714.* I know as a matter of fact that it does often occur. If an analyst receives samples badly sealed, is it not a common thing for him to call the attention of the inspector or of the local authority to the fact?—I never knew an instance of the sort, because I do not see why they should badly seal it unless the actual seal itself is bad, and then there may be some reason for complaint. I never heard of an analyst speaking about it.

6715. If a sample has been sent by ordinary post and not by registered post, would not the analyst call the attention of the inspector or the local authority to that fact?—He naturally would I should think, but I never knew of a case where it was done.

6716. It has been done at my own laboratory; I am not a public analyst myself, but it is within my knowledge that it is frequently done. Taking it on the whole, is there more adulteration in the case of milk than in the case of any other thing which comes under your purview?—We take more samples altogether of milk.

6717. May we describe it as the favourite medium for adulteration?—I should hardly like to say that. We take more milks I think because we regard it as the all-important article of food; we regard it as being the most important of all things, and that is why we take so much milk.

6718. Under whose directions do you take samples? Is it left entirely to you as regards the number of samples you take, or the times at which you take the samples, or the kind of samples you take?—The practice varies a great deal all over the country in that respect. In some cases the inspector is given to understand that he will be required to take, or that he is expected to take, perhaps 100 or 200 samples, as the case may be, or 300 samples during the year.

6719. That generally arises out of an arrangement with the analyst, by which the analyst has so many samples in the course of a certain period, does it not?—That is a thing I should hardly like to say.

6720. You would not know?—No; but I do know when an analyst gets an appointment there is something of an understanding as to the number of samples that he should analyse during the year, and if this number is very greatly increased it is quite reasonably expected that there will be an increase in his emoluments. I mean to say his salary is apportioned to the number of samples that he is expected to analyse.

6721. Inspectors are very often instructed to send so many samples during a certain quarter, are they not?—Yes, no doubt.

6722. To take so many samples during the quarter?—Yes, and in some cases the public analyst tells the inspector when he would like them.

6723. And very often at the end of the quarter there comes a big rush of them?—I am not aware of that; perhaps it is so, but I do not know that.

6724. The analyst does not tell you how you are to take the samples?—No.

6725. Does the medical officer of health ever instruct you?—Occasionally that is done. The practice varies, you know, in different places.

6726. With regard to the taking of subsequent proceedings, is that generally decided by the local committee?—The practice in that varies very much.

6727. But you hinted that very often the analyst is consulted as to whether proceedings should ensue or not?—I do not think that is the case. As far as my own experience goes, and as far as I know, the analyst is never consulted, he merely gives us his certificate, and prosecutions in our case always follow on adulteration.

6728. So that he has nothing subsequently to do with it after delivering his certificate?—Nothing at all unless he is required to be called to the court.

6729. Sunday morning is rather a favourite time for taking samples of milk, is it not?—Not with the inspector.

6730. I do not know where that model inspector is, for the experience I have of them is that Sunday morning is rather a favourite morning; have you never heard it so stated?—I have taken samples myself on a Sunday morning, but my own experience of Sunday morning sampling is that the results were not exactly what were expected. The reason that they are taken on Sunday morning is because we have it in our heads that the milk vendors think the inspectors will not be there on Sunday morning, and consequently they can adulterate with impunity. But we do not find that to be so. We do not get a larger proportion of adulterated articles on Sunday morning than on any other morning.

6731. I can certainly speak for counties where that is the case, and very clearly so?—That may be so then; I can only speak from my own experience.

6732. You mentioned just now that you never like picking a particular time for taking samples, and you rather hinted that you would not think it quite in accordance with justice to do so, but, after all, you are put there to protect the public, you have to deal with a number of people who are decidedly sharp people, and you tell us, and I think rightly, that you have to meet them in their own way; do you consider then that there is anything at all wrong in watching for an opportunity of catching a man and securing a conviction when you are dealing with somebody that you know to be doing a dishonest trade?—No.

6733. You do not consider it wrong then?—No.

6734. Is that not what the inspector is for?—Yes. I should certainly take some special steps in a case of that sort. May I say that there is one thing which the Committee may be able to deal with that I find a most pernicious practice. In a house that I know, a private house, not a shop at all, there were three people—I think there are now four people—who are registered milk sellers at this one premises; they have to be registered by the County Council as milk sellers, and there are, I think, four living in that one place now, and it is their registered place of business. I know they are carrying on a nefarious trade, I know that adulterated milk is being sold there, and I know that they know how to trick the inspector as well as I know myself—and it would always be pretty easy for vendors to do it if they only knew how. When you get an adulterated sample from one of these people, as I have got, a conviction follows, but you can never get a second conviction in that house, although it is the same milk that is sold, because they change the proprietor every time you take a sample. If you go there and buy a pint, the required quantity of milk, their suspicions are aroused at once. I had an experience that was anything but pleasant with this particular place. I employed a girl such as would be likely to go for an ordinary purchaser to buy a pint of milk. I said: "Whatever you do don't say it is for the inspector." She said: "Oh, all right." She was a girl about sixteen or seventeen years of age. "Say nothing else, but ask for a pint of milk and pay the money and bring it to me." She brought it to me outside after purchase, and a said, as I invariably do: "Was anything said to you or did you say anything?" so she

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said: "Yes, they asked me who it was for." I said: "I knew they would do that, they always do that; what did you say?" She said: "I said it was for my mother." That was not true. But it was the child's way, and to trick these people it did not appear to be a very violent thing to do. The sample was adulterated, and the people went to the court. I told the girl that she must say everything that had transpired, and that if she was corrected for having said that this milk was for her mother, she was to say it was my fault, and that I told her to say it was not for me. She did; and I had one of the unpleasantest quarters of an hour that I ever had, under Mr. Plowden, who was reading me a moral lesson for quite that time about teaching young people to lie. That is the sort of experience one gets when trying to trick those people; the magistrates seem to be fairly against us.

6735. By virtue of their position and the awkward work they have to do inspectors naturally incur a certain amount of odium?—Naturally.

6736. Just as public analysts do?—Yes.

6737. It is in the discharge of painful but necessary duties?—Yes; but I do not think anyone gets into that position of odium like inspectors do.

6738. You mentioned the difficulties you have to meet when cans go round in barrows and so forth; amongst other things, that two cans are sometimes used; when you have knowledge of this, what is there to prevent you taking a sample from each can?—Nothing.

6739. Why is it not done?—Because the vendor would tell me it was skim milk, and it would be. Of course, the object of carrying the two cans is because he is selling skim milk or separated milk for new milk.

6740. You mean if it were made obligatory to mark separated milk this fraud would not be perpetrated?—Quite so. Even when they are carrying the can in their hand to the door it should be marked then, and I could demand a sample of it from him, presuming always that the contents were as marked.

6741. Did you ever hear of the sampling of milk being done by taking a glass or other tube and putting it right down through the milk, closing it at the top with your finger and then drawing it up—you do not know that way?—No.

6742. You have spoken of getting pennyworths of milk, and of the fact that if you asked for a pint of milk it would raise suspicion?—Yes.

6743. But there is nothing to prevent you, when you send one of your agents to buy a smaller quantity of milk than a pint, from seeing where that is taken from and then going in yourself to demand a sample from that lot?—I am afraid there is.

6744. Would the position of the persons selling it enable them to say it was separated milk, whereas they had sold it to the previous customer as milk?—We have no authority at all to go into a shop and demand a particular sample of milk. We can demand a sample of milk and we must be served with what they serve us, but to demand it from a tin and to say that that must be new milk, I do not think we can do. In the case of margarine, that has to be marked, and if it is not marked margarine it is by law presumed to be butter, and we can take a sample from it as butter. But that is quite different from milk; milk is not required to be labelled.

6745. May I take it that you could not send an agent into a shop to buy a pennyworth of milk and then go in yourself and get a sample from that same vessel from which he was supplied?—No, but even if we did there is nothing to prevent their saying it is separated milk.

6746. (*Chairman.*) But then you could have them there—surely you could say this man has just bought what is supposed to be whole milk out of that particular can; you told him it was whole milk, and you tell me it is separated milk; there must be a lie somewhere?—There are only two people in the shop generally when the thing is done, or if there is a third person it is a relative of the shopkeeper or somebody connected with the shop, and he would immediately tell me, or whoever sold it would immediately tell me, "I told the man it was separated milk that I had served him with, and he bought separated milk." The man would say "No," but the two would say "Yes," and the two would be believed.

6747. (*Dr. Voelcker.*) But you send your agent in to buy a pint of milk?—Yes.

6748. And your agent is sold a pint of milk out of a certain receptacle?—Yes.

6749. It is upon that, should it prove to be adulterated, and upon the word of your agent, that the person may be convicted of selling an adulterated article?—Yes.

6750. It hangs entirely upon their word?—Yes.

6751. If then you go in after your agent has made a purchase of a pennyworth and buy out of the same vessel from which your agent has already bought, surely you are entitled to take a sample of that and have it analysed?—Yes, perhaps I may be, but I doubt whether we should get a conviction on it, because they would immediately tell you that the sample that was analysed was sold as separated milk, and that the sample which was purchased in accordance with the Act was not the article that I submitted to the analyst to be analysed. The pennyworth is the article that is purchased in the ordinary way under the Act; the other one would not be purchased in compliance with the Act at all.

6752. The necessity of having at least a pint is simply a regulation of Somerset House; it is not in the Act, is it?—No.

6753. (*Major Craigie.*) Do I understand you to say that it is a regulation?—They have issued some instructions and it is published in their year book—their report. Instructions are issued as to the quantity of various articles, a list of the various articles which inspectors should purchase is given, and amongst those articles is milk, and the quantity of milk to be purchased is a pint.

6754. That is a matter which, being a matter of regulation, can be suggested to be altered; it is not a matter of law?—That is so.

6755. (*Dr. Voelcker.*) Then, with regard to the corking of the bottles and the enclosing of them in bags, do you think, as a matter of fact, that many difficulties arise through want of attention to those points?—No, they have not in the past, because there was not the same inducement to do it that there is now. The difficulties that I am anticipating are the difficulties that have been created by this Act setting the certificate of the vendor's analyst on an equal footing with the public analyst's certificate. An object has been created for tampering with the sample.

6756. Has it ever been suggested that the samples have been tampered with by the inspectors?—Has it ever been suggested? I can hardly give you a proper answer to that—not to my knowledge.

6757. I will put it to you in this way—the third sample you keep yourself?—Yes.

6758. You tell us you put it in a refrigerator; might it not very well be said that you opened it yourself—you have got the seal and could put the seal on again?—Yes.

6759. There is nothing to prevent that occurring?—No.

6760. Has any difficulty ever arisen in that way?—No. It is not very likely to arise, because the only object of this third part being retained is that it may be sent to Somerset House if the vendor requires it, and almost invariably the result of the analysis of Somerset House is more favourable to the vendor than the public analyst's; so a difficulty of that sort could not arise. I have never known of an instance where an appeal to Somerset House has made it worse for the vendor.

6761. The tendency is rather towards leniency, is it not?—Yes, I think so.

6762. But as far as you have heard the question discussed this may arise from the different conditions under which samples are analysed, the first analyst has it when it is fresh and subsequently it turns sour?—That appears to be the difference.

6763. You have heard that stated?—Yes, and seen very many statistics to prove it.

6764. Have you found great differences between public analysts and outside analysts on the same sample?—Yes.

6765. Do you think that there is a good deal of cause of complaint?—I think there was a very great cause of complaint, but I think that cause has been to a very large extent removed by the new Act, because anyone that was an analyst or put himself up as an analyst was entitled to sign a certificate under the old Act, but in this case he is to be an analyst holding a public appointment; he must have shown his fitness; so now I think that difficulty has been very much overcome.

6766. You are inclined to agree that those differences have considerably diminished of late?—I think so; hence

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the possibility of tampering with the second part before it goes to that analyst.

6767. When you have found a difference expressed by analysts on the one side or the other, on what have those differences been founded—on actual differences of analytical figures or of opinion based upon those figures?—I have known both to occur—slight differences in analytical figures, but, generally, differences in the deductions drawn from the same results.

6768. Generally in the deductions from those figures?—Yes.

6769. When Somerset House has been called in to adjudicate would you not be inclined to say that of late the tendency has been to have a much closer agreement than was the case in former years?—To my knowledge that is so.

6770. In other words, the system is working more harmoniously now than it did?—Yes, we can see evidences of that.

6771. Have you any knowledge yourself of the standards or supposed standards for milk, or have you not troubled yourself about them?—I know of them, but not of my own knowledge.

6772. And you would rather not say anything or express any opinion on that point?—I would rather not. I may say that amongst the inspectors who have communicated with me on the subject, the Chief Inspector of Dundee and the Chief Inspector of Glasgow have both written to me upon standards and have expressed their sincere hope that it will be very considerably raised by the Committee.

6773. We have heard a good deal here from some witnesses as to the position of analysts—public analysts more particularly—and we may sympathise with our brethren in distress; is it your experience that analysts are very anxious for convictions?—I do not think they are.

6774. With regard to the itinerant vendors of milk, have you found that with the men who go about selling in barrows in the poorer parts of the towns there is more adulteration of milk in their samples than in others?—More than there is in the ordinary retail milk sellers' shops. The greatest proportionate amount of adulteration I think is in the cafés and refreshment rooms where they sell milk by the glass. Those appear to me to be the places where the most adulteration occurs; at any rate, that is our experience. The itinerant vendors no doubt sell more adulterated milk than is sold in the shops.

6775. Could you from your experience draw any distinction between the quality of the milk sent from farmers and taken at railway stations, and of the milk as it goes into consumption by the people?—No.

6776. (*Major Craigie.*) I think you have not given any particular evidence relating to the taking of samples of cream as distinct from samples of milk; have you anything to tell the Committee as to the method employed in taking samples of cream?—The method is precisely the same except that the quantity is smaller. These wide-necked bottles are used for it, not the small ones. With that exception I do not know that there is any difference in the method of collecting.

6777. What is the quantity suggested of cream?—Half a pint.

6778. On the question of condensed milk, what is the quantity taken there?—We buy a tin of it.

6779. The whole tin is taken?—Yes.

6780. Have you any experience under the recent Act since it came in force this year of the taking of samples of condensed milk not properly marked in accordance with Section 11?—I have not had any experience of taking it under this new Act.

6781. Your association deals only with sanitary inspectors, and therefore you are not speaking for all the inspectors who are working under the Food and Drugs Act?—No.

6782. Have they any other inspectors employed for the purpose such as police officers and weights and measures inspectors?—They have special inspectors employed under the Act only.

6783. Under the Sanitary Acts?—Under the Food and Drugs Act; there are inspectors employed under that Act solely who do nothing else.

6784. There are no such persons, are there, as inspectors under the Food and Drugs Act? According to the Act of Parliament the persons who can take samples are either medical officers or sanitary inspectors (that is inspectors under the Public Health Act) or weights and measures or market inspectors in certain cases, or police constables; all those may be employed under the Act?—Yes, but I think any special officer may be appointed because when we are appointed we are appointed as sanitary inspectors and inspectors under the Sale of Food and Drugs Act.

6785. Undoubtedly you can act under the Food and Drugs Act because you are an inspector of nuisances?—But I think a special inspector may be appointed for that purpose, and no other.

6786. I wanted to know whether your association embraces the other persons who are acting under the Acts or whether it only embraces, as the heading of your *précis* says, sanitary inspectors?—That is so; the Sanitary Inspectors' Association is all that I represent.

6787. Only sanitary inspectors?—Yes.

ELEVENTH DAY.

Thursday, 3rd May, 1900.

PRESENT:

Lord WENLOCK, G.C.S.I., G.C.I.E. (*Chairman*).

Mr. GEORGE BARHAM.
Mr. GEORGE COWAN.
Major PATRICK GEORGE CRAIGIE.

Mr. S. W. FARMER.
Mr. SHIRLEY F. MURPHY.
Professor T. E. THORPE, F.R.S.

Mr. R. HENRY REW, *Secretary*.

Mr. C. F. THWAITE called; and Examined.

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6788. (*Mr. Barham.*) You are the proprietor of the Crown Hill Dairy, West Norwood, I believe?—Yes.

6789. You have a large connection there in the neighbourhood of Norwood and Streatham?—Yes.

6790. You are Vice-President of the Dairy Trade Protection Society, and a member of the British Dairy Farmers' Association?—Yes.

6791. You are also a member of the Committee of the Metropolitan Dairymen's Society, who, we understand, have asked you to represent them before this Committee?—Quite so.

6792. And you are here for that purpose?—Yes.

6793. You say in your précis, that milk is an article that varies naturally with the seasons of the year, and to such an extent that you think it is difficult to fix a standard that will be at all times just to the producer and the retailer?—Yes, that is so.

6794. Will you give us instances of that?—One of my principal points with regard to that is the recent analyses that we had at the Dairy Show of various cows' milk.

6795. (*Chairman.*) This Committee has—I think wisely—resolved not to go into milk tests or samples at a show; we wish to get the history of the milk in its natural conditions, and we have no doubt whatever in our minds that the milk produced at the Dairy Show is produced under abnormal conditions, and therefore cannot be relied upon as a safe guide for us; so I hope you will be able to give us figures outside the Dairy Show?—My only point with regard to that, if I may say so, is that the abnormal conditions seem only to have affected one class of cow.

6796. Even then I do not know that that would affect the general question outside of dairy shows; I have no doubt dairy shows may produce all sorts of curious results, but at the same time I do not think we can look upon them as the results to be looked for from the cows of the country generally; therefore, perhaps, as you have large experience outside dairy shows, you will rather shut out the dairy shows?—Of course we meet in everyday life with abnormal conditions, just the same as we do in the Dairy Show.

6797. Very well; we shall be very glad to hear any of those, please?—I should like to draw attention to a cold and wet season on first turning out.

6798. That is this time of the year?—It is hardly cold enough. We have had an exceptional spring; certainly a warmer spring than usual, although it is late. We have met with that difficulty. We have a late spring, and in consequence the conditions when turning out the cows are not the same as usual; they are really abnormal. We are really getting a better milk than usual in the spring.

6799. This year?—This year. As a rule before we turn out the fat and the non-fatty solids are high, and when we have turned out—especially as we do in the spring, and get a lot of wet and cold winds—the fat shrinks and the non-fatty solids go up. The same as last year in the drought, it was noticed exceptionally that the non-fatty solids were so low as to make one suspect the addition of water; in fact, analysts not knowing that the milk was genuine would have returned it as added water. I had one or two cases myself where the fat was abnormally high, and the solids not fat extremely low. I do not know whether you have had drawn to your attention the experiment that Professor Stokes made at one farm particularly where similar conditions were noticed. It was known to be a genuine milk, but the fat was coming exceptionally high, and the solids not fat were so low as to make one suspect water. He went down himself to this farm, and he analysed a sample of every cow's milk, and also a sample of the collective number of cows—the whole herd of thirty-five. The result of that was that from the mixed herd of thirty-five cows the total solids he found to be 12·60 per cent.; the fat was 4·75, and the solids not fat were 7·85. I think any analyst would have returned that as a very much watered milk. That is one point in question. Then there is another thing that I should like to come to. I dare say you remember that last year there was a great outcry of tuberculosis. The British Dairy Farmers' Association, of which I have the privilege of being a member, tried if possible to get to the bottom of that, and to find out really what were the guilty cows, and what were the conditions in which they were kept. Various members were written to, asking for their cooperation, and nine different farms where cows were kept under different conditions were placed at the disposal of the Society for the tuberculin test, covering about 460 cows. In two of the farms not a single cow responded to the tuberculin test, and it was proved that these cows were kept in the open the year round. To the dairy trade generally, who want to produce and sell healthy milk, as well as pure milk, that gives us a lesson, that if we wish to produce healthy milk we must keep our cows in the open all the year round. Again there are the climatic changes. It is no uncommon thing in this climate for the thermometer to vary 10 degrees in twenty-four hours. You may get your cows in a regular temperature outside for two or three weeks, and then you may get a sudden drop in the temperature of 10 degrees in twenty-four hours, perhaps with a cutting north-east wind, and we all know what that means in regard to the shrinkage of the milk. When you have a cold north-east wind you must get naturally less fat in the milk, because the fat goes to keep the cows warm, and you cannot possibly change the food in that short space of time to make the difference in the fat in the milk. That is one very strong point to my mind with regard to the abnormal condition of milk at different times of the year. I, myself, have had samples as follows, which I think you will consider are rather peculiar. One shows 12·47 of total solids, made up of 4·2 of fat and 8·27 of non-fatty solids. There you get an exceptional fat, and abnormal solids not fat.

6800. Is that from a herd?—From a herd.

6801. Of how many cows?—Twenty-six. Now, most analysts would return that as watered milk. I have another one of 12·15 of total solids, the fat being 2·90, and the non-fatty solids 9·25. I have also others, but I did not wish to trouble you with figures, because I know you have had any amount put before you; but those I think are the principal things that make my Society think that it will really be a most difficult question for you to decide as to whether we shall have a standard or not. It seems on the face of it almost impracticable that a standard can be adopted that will protect the honest man. We, as a Society, are with you in doing our best to put down fraudulent transactions, only we feel that it must not be at the expense of the honest man.

6802. (*Mr. Barham.*) I understand that the Society does not advocate a fixed standard?—No, they do not.

6803. They suggest that the standard should be a standard of purity as from healthy, well-fed cows?—Quite so.

6804. So long as the milk was sold in a pure state; even if the quality of it was what is called abnormal, they would think that it would be quite fair that such milk should be disposed of?—Yes.

6805. They consider that it would be quite impossible to replace such a dairy milk as you speak of when there is a change of temperature, and even if the dairyman himself knew, or the producer knew, that that milk was below the standard he must sell it, because it would be impossible for him to replace it for the moment?—Quite so. There is one other thing I should just like to mention. I notice, in the minute of appointment of this Committee these words: "Shall for the purposes of the Sale of Food and Drugs Acts, 1875 to 1899, raise a presumption until the contrary is proved that the milk or cream is not genuine." I should like to point out our difficulty there. Even supposing we say that we wish no standard but that of purity—we are turning out, we will say, about the beginning of May, it is cold and wet, perhaps, a week or two after we have turned out; naturally that makes a difference to the milk in its constituents. A sample is taken; we know the milk is perfectly genuine; we know that it has come direct from the cow, and has not been tampered with; but we are prosecuted for abstracting the fat. Knowing that the milk is genuine we appeal for an adjournment to prove that that milk was genuine; it will be possibly ten days before the case will be heard in the first instance, and possibly a week or ten days before the case would be re-heard from the adjournment, so that perhaps twenty days would elapse before you had an opportunity of taking the two inspectors down to the cows to see them milked. At that time the surroundings—the weather and the climate generally—may be totally different to what they were at the time the cows produced that milk that you declare was genuine; and instead of being able to prove your innocence, you really prove that you are guilty, because the cow gives a better milk than the sample which has been taken in the first instance. There, again, would be a difficulty; we should simply be referring to the cow, and the cow would be proving us to be not only instigators of fraud but tellers of untruths. You see our difficulty there. I think that is also a very strong point.

6806. A strong point for not fixing a standard?—Quite so.

6807. In the opinion of yourself and the Society, you say that milk, seeing that it is a natural article, even if it is below the standard, so long as it is pure, cannot possibly be considered an adulterated one?—Quite so.

6808. That is the opinion of the producers and the trade generally?—Yes, that is their opinion.

6809. You have mentioned the difficulty of the appeal to the cow, but you have not mentioned another difficulty that perhaps may occur to you, and that is the expense of a second hearing—the expense of barristers or other lawyers engaged on both sides of the case, and the difficulty, and indeed the great addition it will be to the duties of the sanitary inspectors if they are called upon at frequent intervals to go down to different parts of the country to challenge the cows?—Quite so.

6810. And if, as you say, on appeal to the cow the milk shall be better than that which was tested or sampled, then, of course, in addition to whatever fine the magistrate would inflict there would be the additional expense of the appeal, and the adjournment, and the going to the

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cows, the analysis, and all that sort of thing?—Quite so; I had missed that point.

6811. Which I suppose, in your opinion, would add very greatly to the expense?—Very greatly.

6812. And indeed to the punishment; it would make the punishment much more severe?—Yes.

6813. I presume the trade have a great difficulty in always maintaining the exact condition of the milk. I mean, suppose the milk, when it comes into their premises contains, say, 3 per cent. of butter fat, and you commence selling, I presume, at 6 o'clock in the morning, and that morning's milk is continued to be sold till probably 2 or 3 in the afternoon; can you with any degree of certainty be sure that the same amount of butter fat with which you started in the morning shall be in the milk during the whole course of the day?—It is an impossibility.

6814. I presume you employ young people behind your counter, and it is very difficult to cause them always to stir the milk sufficiently; and I presume that when milk is poured into a receiver it stands at a depth of, say, 2ft., as it does in the churns, and in your receivers it is very difficult indeed to keep that milk thoroughly mixed up from the top to the bottom?—Very difficult; in fact, it is almost an impossibility.

6815. I presume that in taking a sample yourself you would go to the trouble of emptying one vessel into the other in order to secure a fair sample?—We always make a practice in taking samples of churns of milk, not only to empty the churn right out, but to empty the milk back again into the churn.

6816. That is in order that you may get a fair proportion of butter fat?—Quite so.

6817. And unless you did that you would feel you had no certainty in securing a fair sample?—Quite so.

6818. Unless that was actually done with every customer you served you would have no certainty that you did not give that customer more fat or less fat than he was entitled to?—There is more difficulty in my mind in the business done with barrows than with carts on that account, because a cart, of course, is constantly on the trot. Where you have a cart round, the cart is not going from house to house along the whole street like a barrow is. A barrow will perhaps stand for half-an-hour at the corner of a street while the man went up a side street to serve some customers, and when he came back he would not think of stirring that milk up before he commenced drawing off again.

6819. He could not, could he? A great many firms seal those churns before they entrust them to the men?—Yes, they do.

6820. So that it is quite beyond the man's power to stir it up even if he desired to do so?—Yes.

6821. (*Chairman.*) In respect to those barrows that you talk of, the man draws off the milk not from the top but from the bottom?—Yes.

6822. Therefore the good milk is always on the top?—Yes.

6823. And if the inspector comes late in the day he is more likely to get a good sample than a bad one?—From the barrow.

6824. Therefore the argument founded on the inspector coming late in the afternoon perhaps might in that respect cut the other way?—Yes.

6825. (*Mr. Barham.*) I presume if an inspector obtained a sample of that milk, say the man started out at one o'clock in the day, and the inspector obtained his sample, say, at 3 or half-past 3 in the ordinary course of his round, that sample would in all probability be poorer than the milk that was originally put into the barrow?—Yes. With regard to the carts I might say that I have made repeated experiments myself from milk measured out of a drum into a churn, and a sample taken before and after. With regard to a cart round there is very little difference indeed, but with regard to a barrow it always comes home richer whatever little drop a man brings back.

6826. You mean that if you sent out, say, 80 quarts in a churn, and the man returned two or three quarts, the quality of his returns will be higher than the milk that he originally started with?—Not in a cart.

6827. Not in a cart?—No, there it would be about the same.

6828. In a barrow?—In a barrow it would be richer.

6829. In cream that is, of course?—In cream.

6830. You know that the morning's milk, at least I presume you do, is poorer in butter fat than the evening's milk or the afternoon's milk?—Yes, that is so.

6831. We have had before us a great number of figures which have shown the average of the two meals, and have shown the quality of the afternoon milk is higher than the usual quality of the morning milk. Supposing this Committee decided to fix a standard, that might be an average quality between the morning's and evening's milk, do you think it would be possible or practicable for any dairyman so to regulate his business as to mix the two meals together before selling it in order to secure what may be termed a fair average of the two meals?—It would be impossible. One thing in the dairy trade that we are most particular about is the mixing of the two meals. If there is anything that will turn the milk sour that will. Even putting a dirty measure in will. When I say a dirty measure, I mean a measure that has been used for mixing or serving milk from one meal would never be put into the other milk without being washed. With regard to the quality I might say that we do get a greater difference some days in the week for this reason: As you know, the railway company vary their trains very much on Sunday to what they do on other days; my farmers especially have to send an hour or an hour and a-half earlier on Sunday night, to what they do on other nights, and the consequence is that all my Sunday night's milk is always richer than the milk is on any other evening in the week, and on Monday morning I get a flush making up the normal quantity, and it is poorer. Therefore, if I was to have an average to go on, I should always be convicted on Monday morning.

6832. Do you ever, in order to protect yourself, mix the Sunday night's milk with the Monday morning's. Do you keep it back for that purpose?—Never, I should not think of such a thing.

6833. Do you not think that any dairyman who is guilty of a practice of that kind would ruin his business in a very short space of time?—Decidedly. One summer would finish business entirely.

6834. Quite so, I should like your opinion with regard to this Committee, and the Association that sent you here, that is the Metropolitan Dairymen's Society; would you have attended here as a witness if you had thought for a moment that they had sent you to advocate either a low standard, or no standard, in order that they might be guilty of malpractices by mixing separated milk with new milk?—No.

6836. Is it a practice for that to be done amongst traders of any reputation at all or any respectability?—No, decidedly not.

6837. Have you ever heard of a chemist being kept anywhere in order that he might test the various samples of milk, and so tell his employer exactly how much separated milk or how much water he might adulterate it with?—I have not.

6838. (*Mr. Cowan.*) Do you believe that some of the milk coming to London is adulterated before it reaches the consumer?—Yes, I believe some is.

6839. In what manner is it generally adulterated?—I have had one or two experiences of farmers. I had one farmer's milk for twelve months, who was in the habit of watering his milk regularly. I could not take any action in the matter, but I simply ended his contract at the end of the twelve months. He sent to another dairyman at Croydon, and I only heard last year that that dairyman, who evidently had not looked after his own interests, had been heavily fined for adulteration; and he terminated that contract at a moment's notice with the farmer. That only shows that it behoves every dairyman to look after his own milk to see what quality he is having.

6840. Do you consider it is the producer that generally carries through the adulterating?—No, I would not like to say that.

6841. There would be a large supply of separated milk coming to your city?—Yes, I believe there is.

6842. Is there not adulteration practised by the addition of separated milk so far as you know?—Not that I know of.

6843. You do not think it is necessary to fix any standard?—I do not. I do not see how a standard can be fixed when I have placed before you the facts that I have with regard to the abnormal conditions of the milk at different times of the year.

6844. We have had evidence before us stating the fact definitely. Do you not think that if a fair standard was fixed it would tend to check adulteration?—At the expense of the honest man?

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6845. That does not follow?—You see the figure that I have given you with regard to Professor Stokes's results is solids not fat 7·85. What would be the report on that with regard to the addition of water?

6846. How do the fats stand there?—4·75.

6847. You can see that if the Committee were recommending a standard of 12 per cent. of total solids it would get over that difficulty?—Yes, it would.

6848. You say that the innocent man might suffer, but do you not think that if an appeal were allowed to the cow immediately after the sample was taken that would prevent any danger in that way?—If it could, but it is not possible.

6849. Could it not be done, say, when the inspector took a sample at a railway station, and found what he thought to be an adulterated milk—could not steps be taken at once to test the cows from which that milk was taken on the very same day?—That would be a different thing altogether.

6850. That would be a possibility, would it not?—It would, but it would entail an immense amount of work and expense on the local authorities if they were to have to verify every sample at once.

6851. But you think it would be possible that the inspector who took the test at the railway station could communicate with someone in the neighbourhood of the herd where that milk was taken from, which is supposed to be impure, and put it to the cow at once—the same day, indeed; it is possible to do that, is it not?—I should not think it would be a likely thing to be allowed to be done, unless the authorities themselves went down or a representative.

6852. They would have a representative there to clear the innocent man, you know; a good deal would have to be done in that way, would it not?—It would.

6853. You gave us the result of a sample of milk, and I am not quite sure that I have the exact particulars down, but it was something like 2·90 of fat, 9·25 of solids not fat, with total solids of 12·15?—Yes, that is it.

6854. Was that the milk of one cow or of a herd?—Of a herd.

6855. Do you know whether that was a proper milk?—Yes.

6856. Guaranteed?—Guaranteed.

6857. It shows almost that there was an adulteration with separated milk there—the solids were so high and the fat so low—or else there was an abstraction of fats there; but you do not suppose there was anything of the kind?—No.

6858. You can guarantee that there was not in that case?—There was not.

6859. You say in your précis that milk is an article that varies naturally with the seasons of the year, and to such an extent that it is difficult to fix a standard to be at all times just to the producer and to the retailer; how do you make that out? If the cows are calving regularly during the season, how would it make such a very great difference at any season of the year?—Have you ever noticed—and I suppose you speak practically—with regard to the difference of turning cows out when you have cold and wet weather, and especially if you have a cold north-east wind—have you ever noticed the difference that it makes?

6860. There is no doubt that a very cold night or a very wet, stormy day, will affect the produce of the animals for that day, but, of course, you can guard against those things to a certain extent, and you may expect normal milk from your cows after such an occasion?—Yes, but my point is that that particular day may be the one on which your sample may be taken.

6861. You should keep your cows in, as we do, on a stormy day?—Our point is that Professor Wortley Axe simply points out that if you want to keep your cows healthy they must be out all the year; those are the cows that are to be free from tuberculosis.

6862. There is no question whatever that cows that are used in that way can stand the severity of the weather very much better than the others, and that they are very much healthier; that is proved, because even so far north as Scotland all my herds of dairy cattle are put out a portion of every day during the year, unless there is snow on the ground. You say it is difficult in that way, because there is so much variation, but surely if the cows are calving generally pretty regularly over the whole season it makes very little difference in the results so far as quality is concerned?—That would be so, but then you see the London dairy trade will not permit of you to be calving regularly the year round.

6863. Indeed!—No.

6864. How is that?—During the month of August and half of September we are simply doing nothing in London, and if we did not arrange so that we have more cows coming in calf in October and towards the end of September we should be simply pouring milk down the drains during August. We arrange especially so that our cows are always giving least towards the end of July and August, and most are calving during the end of September and the beginning of October.

6865. Is that to keep the supply short?—It is to keep the supply short during August, when we do not want it.

6866. I thought that was the time when there would be a very large consumption of milk?—No, we drop gallons a day.

6867. You speak of a considerable difference between the morning's and evening's milk?—Yes, that is so.

6868. Is that caused through the irregularity of milking?—No.

6869. How is it caused?—There are various arguments with regard to the cause of it. One particularly strong one is that the nights are a great deal colder than the days, and the fat in the cow would naturally go to the body to keep it warm during the night; hence there is not so much fat in the morning's milk. That there is the difference is proved, of course, by our own figures. My own average about 0.6, as the difference between the night and morning milk in butter fat.

6870. You think that is not caused by the irregularity in the hours of milking?—No.

6871. Would it interfere much with your trade if more regular hours were adopted—that is regular intervals, say, of 12 hours? We have had it before us that the milk sent to a number of large towns is milked, say, at 6 o'clock in the morning, and about 2 in the afternoon, or at intervals of 8 hours and 16 hours, in which case it is shown that the afternoon's milk after the short period of rest is very much richer in butter fat than the milk that is taken after the 16 hours' rest?—Yes.

6872. That is one reason which has been given before this Committee why the great difference between the morning's milk and the evening's milk takes place; that is stated as the cause of it?—It would not be practicable.

6873. Then you would not be at all against a regularity of hours being enforced for milking, say, at 12 hours' intervals; you do not think it would interfere with your trade if such was done?—That is about the time that does elapse.

6874. 12 hours?—12 hours.

6875. (*Professor Thorpe.*) You say the milk you get in the district you serve has been milked at equal intervals of 12 hours?—As near as possible.

6876. And you also tell the Committee that there is a wide disparity in the amount of fat at the two intervals?—To the amount that I have stated.

6877. What is that disparity?—0·6.

6878. Are you a farmer yourself?—I am not.

6879. Have you ever kept cows?—I have not. I might mention that a good many of my figures with regard to my own milk is what I have seen personally milked myself. I have seen the milk milked; I have seen it cooled over the refrigerator, and I have come up in the train with the milk. That ought to be sufficient evidence, I think, as to the result of my figures.

6880. I think perhaps we had better address ourselves to the practical question. You come before us as a retail dairyman, in order to express the opinions of gentlemen who are in your own trade. I suppose milk prosecutions will continue to go on, will they not?—I suppose so.

6881. Presumably they will continue to go on very much on the same lines that they are now conducted—on lines which implicitly recognise the limits of fat, and non-fat; is that not so?—I believe so.

6882. Therefore we have got to do with a practical question, have we not?—Quite so.

6883. What are the limits which in future shall guide persons concerned in making such analyses? Are you aware what the present limits are?—I believe 3 per cent. of fat at the present time, and 8·50 of non-fatty solids.

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6884. Who adopts those limits?—Somerset House, I have heard.

6885. Do the analysts, as a rule, adopt those limits too?—That I cannot say, because I believe they vary.

6886. Do they adopt any higher limit to your knowledge than that?—Not to my knowledge.

6887. Do they adopt a lower limit than 3 per cent. of fat and 8·5 of non-fatty solids?—That I cannot say.

6888. Anyhow, you know that analyses are judged by a standard of 3 per cent. of fat and 8·5 of non-fats?—That is what I have heard.

6889. Presumably they will continue to be judged by some such standard?—Yes.

6890. Do you mean to tell the Committee, therefore, that such a standard is an impracticable standard?—My principal point is from the evidence that I have tendered that there might be cases where fat would be below 3 per cent., and where the solids not fat would be below 8·50, and that an innocent man might be wrongfully accused and punished for selling milk below that standard when it was perfectly pure and genuine.

6891. Are you prepared to tell the Committee how frequently such cases of injustice could in the nature of things occur?—I cannot, because it would all depend on the climate.

6892. I am speaking of England, where, as you know, the conditions——?—Even there it varies very much, as we know.

6893. As regards climate, do you imagine that there has in the past been a great deal of hardship in the application of such standards as have been made use of?—I cannot say there has been a great deal; there is no doubt there have been cases.

6894. There have been isolated cases no doubt of hardship, but in the main there has been no great outcry either from your trade or from the community, or from anybody concerned, of the rigour of the standards which have been applied?—No.

6895. I should like to get from you, as a practical man, representing the trade, which, of course is very largely concerned in this matter, something else than the *non possumus* attitude which apparently you have taken up, because, of course, we are practical men, having to deal with a practical question in a practical way. At present you have given the Committee no assistance whatever in arriving at a solution of their difficulty; you have simply told them practically that no standards are possible?—In the opinion of my Society.

6896. In other words, you argue from exceptional cases that anything like a general application is impossible?—Quite so.

6897. And you give the Committee no idea of the proportion of such exceptional cases?—No, that would be rather difficult. I am not acquainted with the trade of Great Britain.

6898. You are probably aware of course that we have had many thousand of analyses brought before us?—Yes.

6899. And therefore we are in a position to judge how frequently those exceptional cases will occur?—Yes.

6900. Do you seriously advise, therefore, that we have either to adopt no standards or a very low standard, because of relatively very exceptional cases occurring; is that the position taken up?—Our Society do not wish the innocent man to suffer for the guilty party.

6901. Does your Society wish, therefore, the possibility of the whole general milk supply of this country to be depreciated, because there may be now and again even a miscarriage of justice?—They do not consider it would; competition is too keen.

6902. I suppose you know that exceptional cases make very bad law?—No, I cannot say I agree with you there.

6903. That is a well-known dictum I think?—Yes.

6904. (*Chairman.*) One or two questions I should like to ask you; you mentioned a case of some abnormalities that you had observed?—Yes.

6905. Did you mean to tell the Committee that you have the experience of a great number of tests, or only of tests made on one particular day in respect of the 26 cows you mentioned?—I have a number of tests.

6906. A number taken over a long period of time?—No, during those particular periods that I am mentioning.

6907. How many days' milk in point of fact would be tested to arrive at the figures you have given us?—Only one day at that particular time.

6908. That is only what occurred on that particular day?—Quite so.

6909. That is, we may say more or less, exceptional?—Quite so.

6910. You go on to say that in a wet, cold May, when the weather is bad for the production of milk, the fats fall very seriously, and the milk is of a poor quality; can you give us any evidence as to what prosecutions have taken place in consequence of the bad milk?—No, I cannot.

6911. Has it been found to be a hardship?—I cannot say.

6912. You have no statistics on that?—No, I have not.

6913. You were also answering Mr. Barham in regard to the expense of the inspectors going down, of barristers being employed, and so on; would there be any more expense in having the immediate inspection suggested by Mr. Cowan as against a dilatory one?—No.

6914. Would it cost any more?—I should not think so.

6915. If there is going to be an inspection why should it not take place immediately?—It might not always be questioned.

6916. I say in cases where the milk is questioned, why should you not have arrangements made for taking an immediate inspection?—It would not be questioned until the summons was heard, and perhaps that would be a week or 10 days after the sample was taken.

6917. But there would be no reason why a man whose milk was impugned should not have an opportunity of proving the contrary at once?—No.

6918. There need not be any more expense in that case than there would be in putting it off for a fortnight?—No. It would be a very good idea.

6919. Therefore the objections you made to Mr. Cowan's proposal really are not very serious?—No, that could be got over in the way you suggest—decidedly.

6920. You are in contact with a number of farmers, I suppose?—Yes.

6921. And you agree with them to supply you with milk?—Yes.

6922. Have you any contract with them as to the standard of milk?—No.

6923. None at all?—None at all.

6924. Do you analyse their milk?—Frequently.

6925. Have you no standard in your own mind as to what they should come up to?—I go for a very high standard myself, but of course it varies. I have noticed, as I pointed out, the effect on those particular occasions. Last year during July and August, or July and September, I think, because August was rather wet—during the drought we had at all events last year my fat was exceptionally high, and the non-fatty solids were low.

6926. And you were satisfied that the milk you were getting was genuine?—It was perfectly genuine.

6927. Your standard, I take it from you varies according to the season of the year, and you have the power of dispensing with a high standard; if you like, in your own mind you can say the season is droughty, and therefore my standard will vary to meet a droughty season; is that not so?—No; I merely casually go through the figures, and account for the figures by the seasons.

6928. Then you have what I say; you have a sort of dispensing power of altering your standard according to what you think it should be?—Quite so.

6929. According to the variations of the season?—Yes.

6930. Now you say you do not advocate a fixed standard at all, but you advocate a standard of purity; what does that mean?—The way you yourself have suggested.

6931. That is to say, there should be a standard, but a varying one?—A standard of purity, as you have suggested—that it should be possible for an inspector to go down immediately that sample was taken, and verify the production of the cows.

6932. What is to make the inspector go down, because the milk has not reached a certain standard surely?—I mentioned that that could not be proved until the summons had been heard, or until the sample had been analysed.

6933. The inspector is not going to make this journey of inspection unless the milk in question does not reach a

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certain standard—that would send him down, would it not?—Quite so.

6934. Then there must be a standard somewhere?—Yes.

6935. I want to get from you what that standard should be—that is what we have got to say?—Yes, I understand.

6936. You yourself admit that there should be a standard, but you cannot help us by saying what that standard should be which should set the inspector going?—It would have to be a shifting standard, according to the seasons.

6937. But you say there should be a standard?—If you have one. Of course I am not being questioned personally; I merely have to give the views of my Society.

6938. Give the views of your Society, or your own; we should be equally glad to hear them. What I want to get from you is that somewhere or other there must be a standard to set this inspector going, otherwise what is to move him?—The analysts have always had a standard, have they not?

6939. Yes, the analysts have; it may be with the analysts, or may be with the public; or it may be with the retail trader, but somewhere or other there must be some standard to set this inspector in motion; surely you must have somebody to move him, else why should he go down?—Yes.

6940. He goes down because the milk does not reach a certain standard. Now, will you tell us what your ideas of the standard should be, and how it should vary?—During the drought, as for instance last year, I should not be surprised to see the non-fatty solids very low.

6941. What do you think would be a safe limit to put to them?—According to the experiments made by Professor Stokes, I certainly have never seen such figures as these that have been reported from him.

6942. And they are?—7·85 non-fatty solids.

6943. And fats?—4·75.

6944. Those are very exceptional figures?—They are exceptional.

6945. Would you fix a standard for the whole country on those exceptional figures?—I should not like to.

6946. It would not be safe. (*A pause.*) I will not question you further on that point. Apparently you do feel in your own mind that somewhere or other there must be a standard?—I think with regard to this question of a standard that it is the most difficult thing that anybody could possibly have to decide on.

6947. That is why we are here?—I do not see really how it is going to be decided to be satisfactory to the honest man; I mean to prevent him in exceptional cases being prosecuted for fraud.

6948. Then how are we to protect the consumer against fraud?—I do not consider the consumer wants protecting myself; I think competition is too keen.

6949. I venture to suggest water is too cheap?—If a person is not satisfied with the quality of the milk he is receiving from one man he is not bound to have it.

6950. You know yourself the ordinary retail dealer in the country and the ordinary consumer who buys a pennyworth of milk surely require protection, both of them—for let us refer to both?—Yes.

6951. It is not the high-class firms—the big firms that are doing a large business, but it is the dealer who supplies the small consumer with a pennyworth of milk. How are we to say that the small consumer gets what he wants to buy and ought to have? There must be surely some standard as between the producer, the retailer, and the consumer?—Yes.

6952. Could you not give us any assistance in that direction? The question of competition does not come in with the man who buys a pennyworth?—I may be allowed to give my own suggestions on the matter, putting the Society on one side.

6953. Yes, we shall be very glad to hear them?—There is one idea that struck me—whether it is worth anything, of course, I leave you to judge—with regard to the difficulty of the variation, and that is this: supposing an inspector takes a sample of a dairyman that dairyman has sent to him the result of that analysis from the local authorities, and he has an opportunity to question it within a given time, say seven days.

6954. It is fourteen days now, I think?—Well fourteen; if he does not no notice is taken whatever; the next sample he has taken, another notice is sent to him, no matter what the result is; and then we will say at the end of twelve months they go for that man on his record. You will soon see then whether those ten, twelve, or twenty samples are genuine milk, or whether there have been any abnormal conditions, or whether the man is a rogue, throughout the year. To my mind that seems to be the best way of dealing with this question of analyses and getting at the rogue. We as a Society are just at one with you in putting a stop to fraudulent practices. I do not come here advocating a low standard for the purpose of reaping pecuniary benefit by reducing my milk either in fat or non-fatty solids, because I might say for the last seven years I have aimed at 3·8 of fat, and have delivered it to my customers; but I have had exceptional cases, as I put it to you, where it has been low both in fat and in solids not fat.

6955. Then you would average the number of samples taken as against a man?—Yes.

6956. And not prosecute him on one but on a series?—On a series.

6957. In fact, you would allow him an opportunity of averaging?—He would not be able to average, I think, in that way.

6958. Not if he was uniformly low?—No.

6959. But if they happened to drop on him just an exceptional once or twice, then it might be shown that he was doing a genuine trade?—Quite so. I should like myself to see more samples taken in certain districts.

6960. Can you tell us anything about cream—do you do anything in the way of cream?—Yes, but I cannot say that I have much experience with regard to the composition of cream.

6961. You do not know in your own mind what you think, as a private consumer yourself, you should expect to get in cream if you bought cream for your own table?—No, I do not.

6962. Do you know anything of condensed milk?—No, nothing whatever.

6963. It is merely pure and whole milk that you deal with?—Quite so.

6964. (*Mr. Farmer.*) On the question of the intervals between milking, is it not the fact that that is regulated to a large extent all over the country by the train service?—It may be in some cases, but in others it is according to the wants of the dairymen.

6965. The farmer in the country can only send his milk to London by the trains, and if the trains will not allow him to milk at regular intervals you see he cannot do it?—That may be it. Of course, I only speak of my own case.

6966. Milk is sent many hundreds of miles?—Yes; some, of course, send very early in the morning, and the others do not send it till later.

6967. With reference to that milk inspection that Mr. Cowan was asking you about, if a sample of morning's milk was taken, and it was found suspicious or wrong, and immediately on the self-same day you sent someone down to take another sample of that milk, you would be really taking the afternoon's milk then?—Quite so.

6968. Therefore you would be really taking a sample of richer milk, and if you wanted a fair comparison you would have to wait till the next morning?—Quite so.

6969. You told us that you had milk from a dairy which you found to be watered continually?—Yes.

6970. But you continued to take it the whole of the year?—Yes.

6971. I suppose you continued to sell it the whole of the year?—Yes.

6972. Although you knew it was watered?—Quite so.

6973. How do you account for the fact that you never were found out?—Because I took very good care not to sell it as it was.

6974. You mixed it with some more?—Yes.

6975. (*Mr. Murphy.*) If the season is responsible for the exceptionally low quality of the milk that you have directed the Committee's attention to, would you not expect to find that affecting milk generally throughout the country, or, at any rate, in the district in which that particular weather prevails?—Where the weather prevails, certainly.

6976. So that a county analyst, if he is getting samples from a number of districts in the county, would have before him the fact that something exceptional was taking place?—Quite so.

6977. And it would be open to him, if he came upon

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something that was distinctive and phenomenal in its character, to take cognisance of that in making any representation to his authority as to whether there should be a prosecution or not?—Quite so.

6978. You understand that the Act, as it is at present drawn, does not provide that a prosecution must inevitably follow if milk falls below a particular standard that might be fixed by the Board of Agriculture?—It does not?

6979. No, it does not provide that there must necessarily be a prosecution; does that in any way relieve you of any difficulty you feel about the fixing of a standard?—I should think it would.

6980. I do not know whether you have had your attention directed to the particular words of Section 4. The wording is: "shall for the purposes of the Sale of Food and Drugs Act raise the presumption until the contrary is proved that the milk, cream, butter, or cheese is not genuine." You see, it does not amount to more than a presumption?—No, but I pointed out the difficulty the retailer would have in proving his innocence in the ordinary way. Of course, the conditions might be totally different by the time that the cow is appealed to compared with what they were when the sample was taken.

6981. Because of the interval of time that would elapse between the taking of the samples?—Quite so.

6982. But I take it that a public analyst is receiving samples in considerable number, and if he found that the samples in his county were, owing to conditions of weather and so on, falling to a very low standard, he would have that in his mind in interpreting his results?—Yes.

6983. It does not follow, as I say, that a prosecution need necessarily ensue, although the low standard would be used as raising a presumption until the contrary is proved—as it might be proved in a particular case—that there was adulteration?—Yes, but then the analyst, we will say, of Lambeth, might not be able to check any analysis of milk coming from Kent.

6984. No, in London, of course, it is not a matter of county administration; it is a matter of district administration?—Yes, quite so.

6985. But it would, no doubt, be possible to obtain evidence from the Kent analyst as to what was happening with regard to milk, say, that was produced in Kent and supplied in Kent?—Yes.

6986. I should like to know whether the fact that certainly a prosecution does not inevitably follow, and, certainly to a less extent, that a conviction does not necessarily follow, would modify your views as to the impossibility of fixing a standard?—It would modify my views.

6987. (*Chairman.*) Has that point been considered by your Society?—I cannot say that it has been.

6988. (*Professor Thorpe.*) Had they not the section before them when they took the matter into consideration?—Yes, I believe so, but then their argument was that it would be difficult to prove. It was more the time elapsing between the time the sample was taken and the appeal to the cow or to the herd that was in their minds.

6989. (*Mr. Barham.*) I suppose that in not fixing a standard the idea was that at present the analyst has a certain discretion which he can exercise according to the season of the year—the drought or what not that may occur—as Dr. Murphy suggests?—Yes, that was the idea.

6990. Then they have a further idea that if a standard is recommended by this Committee it would be a fixed standard?—Quite so.

6991. And the analyst would have no discretion in the matter.

6992. (*Professor Thorpe.*) May I point out that the analyst already has a fixed standard, which is an invariable one throughout the year, and therefore in that respect the position will not be altered in any way from what it now is. There is a standard, and whatever we do there will be a standard, and what this Committee is here assembled for is to ascertain whether that standard has been properly fixed?—Yes, I understand.

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Mr. JOSEPH ALFRED SMITH, called; and Examined.

6993. (*Chairman.*) You come here from the Eastern Counties as the hon. secretary of the East Suffolk Chamber of Agricultunre and the secretary of the Eastern Counties Dairy Institute?—Yes.

6994. Have both of these bodies taken this matter into consideration?—Yes.

6995. And you come here to represent their views?—Yes.

6996. Have they passed any resolutions upon the subject?—No, they have not, but I have been at some pains to gain the views of the principal members of our Chamber and those who are interested in the matter.

6997. Have you come up to tell us what their views are?—Yes.

6998. You say that in the East of England, where there is a great deal of arable land still left, the conditions of dairying are different to what they are in what are known as the dairy districts?—Yes, very much so; there is greater variation. Our climate is not so genial; we are subject to sudden changes of temperature and very cold nights, and also to variations in the moisture of the atmosphere—sometimes it is very dry, for instance. All that has a considerable effect on a dairy herd.

6999. You say your cows are subject to fluctuations from other causes generally recognised, such as the periods since parturition, the breed of the cow, morning or evening milking, and so on?—Yes.

7000. Your cows are subject to other fluctuations than those?—Yes. I imagine there is no part of England that is subject to such serious variations as we are in the Eastern Counties. We suffer under great disabilities in that way.

7001. What is the result on the milk?—It causes great variations both in the quantity and in the quality.

7002. The quality is the point to which we must direct our attention, please?—I will take it that if cows live naturally—that is, if they had only the herbage which they gather from our fields or pastures—the high-water mark of quality would be reached just before the grass is flowered, when the grass is most nutritious, and perhaps the low-water mark would be reached about this season of the year, when the grass first begins to grow and has very little quality—that grass acts apparently as a great inducement to the flow of milk, and really you get a great increase in quantity—an enormous increase in quantity—and a great natural addition of water to the milk.

7003. Have you any statistics as to the results of analyses in your part of the country?—I have been looking up some of our herds; perhaps I might give you what I might take to be the high-water mark in that way by some figures taken from two of the best herds I know. One is Mr. Garrett Taylor's herd, near Norwich. He keeps seventy-three cows, and in 1898 he took a careful record of the quantity and quality of each cow the whole way through the year, and the average, taking the whole year through, was 3·88 of butter fat.

7004. That is morning and evening milk?—Yes. Then Mr. Harvey Mason, of Necton Hall, has a herd of pure red polled cows—forty-three cows. His average was 4·09. Then Mr. Alfred Smith, of Rendlesham, has another herd. He kept a record of everything else but the butter fat, but he believes his average is about the same. They are three of the best herds, perhaps, that we have in the Eastern Counties.

7005. What class of cow?—They are the red polled cows. They used to be known as the Norfolk and Suffolk red-polls; now they are known as the red polled cow. It is a well-recognised breed.

7006. Would you say, generally speaking, that if any farmer had red-polled cows in any part of the country he would have no difficulty in getting satisfactory milk?—No. I am satisfied from my observations at the Dairy Institute that, Jersey and Channel Island cows excepted, we get from red polled cows much better quality than from the ordinary cow of the district. The ordinary cow of the district is a cross-bred cow; some of them, of course, bred much better than others, and we have improved the breed by the use of Shorthorn bulls very largely in the district. The average cow of the Eastern Counties is a cross-bred cow, more or less Shorthorn, and more or less Suffolk; perhaps with a little infusion of Dutch. I am quite sure they do not reach anything like the standard I have mentioned to you; in fact, under certain conditions, of course, a more or less ill-bred cow would fall lower than a well-bred cow would. That follows as a matter of course, so that the first cows to touch the low-water mark would be those that are the worst cared for and the worst bred.

7007. Should the standard be fixed so as to include them?—It seems to me that it must; otherwise you would be doing an injustice to those farmers. Of course, I am very anxious myself to encourage high farming and the best of management; but it seems to me that it would be unfair and unjust to penalise those farmers who had not the best cows and the best pastures, and are not using the most artificial food; I think it would be unfair and unjust to penalise them as having adulterated their milk when they have not done so at all.

7008. Do you think the milk of the whole country should be lowered down to the standard of the worst bred and the worst fed cows?—Unfortunately, I am afraid you must take that into consideration to a very large extent. I think if you went above 2·8 of butter fat, you would very often catch those farmers at certain seasons of the year. I was just speaking about the natural food of the district. I do not know whether the Committee take that view of it. Of course, most of our best managed dairies use artificial food more or less the whole period of the year. I know many dairies where grains are used the whole year through, and farmers who are feeding for the milk supply naturally in their own interests use brewers' grains, because of all the foods that we have I do not think there is anything which is such an incentive to milk production as fresh brewers' grains. I have tried it repeatedly, and seen it tried myself. Where the cows are used to brewers' grains, and are without them for a few days, the milk supply falls off immediately. I do not think you get a rich milk from them, but you get quantity. It excites the milk glands—there is no doubt about it.

7009. Do you think that is a sort of stuff that ought to be put on the market?—I do not think you can taboo the use of brewers' grains; they are a recognised article of food. I do not think it would be fair to penalise a farmer because he uses brewers' grains.

7010. You do not think the public would have a right to expect a better class of milk than the lowest that can be produced generally?—I do not wish you to infer that from what I say; I am, of course, looking at the justice of the case.

7011. Do you not think yourself that a fairly high standard would have a good result eventually in raising the breed of cows throughout the country and getting rid of these rubbishy cows?—Yes, I fully agree with that, but I thought really the question was the question of whether the milk is pure or not. If you place your standard too high there will be a manifest injustice. Of course, that raises the whole question, and that makes the question one of such great difficulty.

7012. Of course, we have to try and keep an even keel between the producer and the consumer?—Yes. Nothing would bring the law so much into disrepute as if it were found that farmers who had honestly managed their cows were convicted of adulteration when there was no adulteration. If that was the result of anything that this Committee did, it would be very deplorable. On the other hand, I am as anxious as anyone to see the standard of milk raised if possible. My opinion is this: that we ought to have milk sold according to its value, but I am afraid the country is scarcely prepared for that yet; I do not think the farmers themselves are quite prepared for it.

7013. That is to say, you would grade milk?—I should like to see it graded; I should like to see it sold according to its ratio of butter fat or solids. There would not be at all a difficulty in arranging a fair basis for that, but I do not think the farmer is himself prepared for it, possibly. Perhaps that would be taking a step somewhat in advance of public opinion.

7014. We have had it here before us from one gentleman giving evidence that feeding cows in the manner that you describe was adulterating milk in the cow, and that it ought not to be allowed, because he considered the consumer had a right to expect a certain amount of butter fat in the milk, and if the farmer weakened it down to such an extent it ought not to be sold. Would you approve of that idea?—I am afraid I could not go so far as that. Of course, it is a well-known fact that farmers who produce milk for sale feed differently to what they do if they are producing for butter; there is no doubt about it. The farmer, who is supposed to know his own business, does it advisedly. If he is feeding for butter—if he is making butter or making a cheese—he looks out for different foods, for instance. Of course, I have the opportunity of testing large quantities of milk in connection with our Dairy Institute; it is my business to do so. I find that the addition of highly nitrogenous foods to the dietary of the cow in the Eastern Counties would bring up the milk very much better than it otherwise would be. For instance, the use of four or five pounds of cotton cake or pea meal, if you add that to the daily dietary of the cow, will make up very much for the deficient quality of our pastures. Remember, our pastures are very poor. Perhaps some gentlemen here would hardly realise how poor our pastures are; our pastures would almost starve an animal unless there was some additional food in some parts of the year, and if highly nitrogenous foods were added at some times of the year you would get very much better quality of milk, more solids, and more fat. It affects both, more especially the solids; and they find that out practically in making cheese. Of course, a very common allowance is a gallon of milk to produce a pound of curd. I have known a gallon of milk produce a pound and a quarter where cows have had supplementary food. It is the practice with some farmers—more advanced farmers, I think—always to feed the cows at the trough the whole year round, more or less. The cows are always baited. Of course, they give more in quantity as well, no doubt, but it does affect the quality to some extent. It is not the breed alone which affects the quality, as is sometimes stated. Then I think the fact is scarcely appreciated that the milk is produced really just previous to the milking. The popular idea is that the cow has an udder in which she carries a large quantity of milk which is drawn almost as you draw beer from a barrel. But I think that is altogether wrong; I think most of the milk is produced at the time of milking—at the time that milking is actually going on, and excitement then will often make a difference. I have noticed the records of the dairy shows, and I daresay you have had evidence on that point.

7015. We have excluded from the evidence all matters relating to dairy shows for that reason?—I have noticed very marvellous changes through excitement.

7016. We are aware of that, and we are confining our attention to the ordinary cow of the country?—I take it on some occasions that a change of milker will very much affect the milk of the cow. One milker will not milk so closely as another. The fat of the milk is largely contained in the last quart that is drawn from the cow, and if an unskilful milker takes a cow even temporarily for one meal or one day, and he does not get the last quart or the last pint from the cow, the average of that sample of milk is very much lowered.

7017. The consumer would lose very much?—Yes, the consumer would lose, yet there has been no adulteration practised and no fraud practised. That introduces another difficulty in the matter.

7018. That is still part of the business—a farmer should see that his cow is properly milked?—I know that, but you cannot penalise a farmer because his man or his employee does not get the last few drops out of the cow; but it makes a great practical difference, no doubt.

7019. A great many people do get penalised if their employees do not do the right things in other walks of life?—Yes, but you would be creating a new offence, I think. My own man, for instance, to-day is ill, and some other man has to-day to take his place. We cannot help that, but I cannot be sure that his substitute is quite as efficient a milker as he is.

7020. Undoubtedly you run a risk with your milk to-day, if you are selling it?—No doubt about that. Then I think that very often the quality of the milk is lowered, not by any wilful act, but by the fact that a number of calves are kept with the cows, and perhaps the calves take more than their fair proportion of the later strippings of the cow. I am quite sure that the standard of milk is often lowered in that way.

7021. Do farmers who supply the milk for the public consumption allow their calves to suck the cows?—Frequently they do.

7022. Is that a good method, do you consider?—No, I think that a wise contractor in the metropolis, for instance, would stipulate that he had the whole of the milk. But you know what business competition is; it is not always done, and if it is done I am afraid it is not always kept to; I am simply stating what I know to be facts.

7023. Still I gather from you that if a farmer manages

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his cows in an ordinary proper fashion he can produce good milk even on the Eastern Coast?—He can produce good milk, but I do not think he can always answer for its being up to as high a standard as in other districts.

7024. Do you know what the standard is now?—It is 3 per cent. of fat, I suppose, now, and 2·8 is by some considered the standard, I think. Still, 2·8 in my opinion would be quite high enough to be fair and just. I think if you put it higher than that you would throw the onus on a large number of farmers to prove themselves innocent, which is perhaps harsh and unnecessary. I know myself that milk honestly produced often falls below 2·8. I have observed that in my own experience; I have tested it frequently.

7025. Are there many prosecutions and convictions in your part of the country for having milk below the standard?—The town in which I live has recently gone through a very interesting experiment on that subject. For many years there was great competition in the town amongst the people selling milk, and one supplier lowered it down to a penny a pint. Of course everyone knows that it could not be retailed at that price. There was a great desire that the farmers and the retailers should combine to increase the price, but one farmer stood out and this spring he said that he would like to join in a combination. Just about the same time the public authorities in Ipswich started a series of prosecutions—a whole batch of them; they made up their minds that some of the milk was adulterated in the town. These two things happening together was rather interesting, because each said the other was responsible for the change. The change that has taken place has really been this, and it is a very interesting one, that all the farmers within ten miles of the town who send milk in, and all the suppliers of milk have agreed to a certain price; and all those that sell the milk, everyone of them, have formed a combination, which is very rare amongst farmers, and it is one of the few I have ever heard of; but that is holding together to this minute. It began on the 1st February, and of course the season has favoured them very much, because milk has been scarce, and the season late; at any rate, that has held together up to the present. The prosecutions took place about the same time. Several people were prosecuted and fined—I think rightly fined—because the milk was very poor indeed; but that has had a marvellous effect on the quality of the milk. The milk is now very much better. What is the cause, I do not wish to say, but I should think perhaps both have some influence on it; perhaps the prosecutions have had some effect, and possibly the combination raising the price has had some effect. You can understand now that the price is raised that every consumer takes care that he has the milk up to the right quality, and that the poor milks have been shut out.

7026. No number of prosecutions could make a cow give 3 per cent. of butter-fat?—No, they could not, but those who supply the poor milk have had to give up doing so or retire; there is no doubt about it.

7027. There has been, so to speak, what you would call an injustice to those farmers who produce poor milk?—No, I do not think there was, under the circumstances, but it is certainly a remarkable instance. There is the fact, and I give you the fact for what it is worth, that the public authorities there did wake up to the fact that the milk that was sold was very inferior, which was brought about by insane competition amongst people to sell it as cheaply as they possibly could, with the inevitable result. At any rate, the fact is this, that the milk is raised in price, and it is retailed at twopence a pint now, which I think is about the lowest that it can be retailed at in a town to pay all expenses, and the quality is very much improved.

7028. Do you know what standard the analyst of Ipswich takes?—No, I do not; whether it is 2·8 or not, I do not know. At any rate the prosecutions were undertaken, and, I think, rightly. I have taken private means to ascertain since how it was it fell so low in one case, and I found that the farmer practically admitted that the milk was cold, and the customers found fault with it, and steam was inserted into the milk to raise the temperature. Of course, that prosecution was perfectly just, and that farmer is unable now to sell his milk, I believe.

7029. You gave us some statement with regard to some of the best herds in your part of the country; should you say the lowest quality is generally reached in April and May?—Yes.

7030. Have you any statistics as regards those particular herds in that period of the year?—No, I have not, unfortunately. I have only the average; I have added up the records of each cow, and taken the average.

7031. Then you cannot point to anything to bear out your statement?—No, but I can tell you as regards my own experience at the Dairy Institute. Having milk every day we are constantly testing it for the sake of the students and for our own information. My experience is that just at this season of the year, when cows are first turned out to grass, and have a large proportion of green succulent food, then there is a vast increase in the quantity and a corresponding decrease in the quality. My own opinion is that it would be very desirable that cows should not be taken off the dry foods quite so suddenly as they are at this season of the year. You will understand the position; the farmer is very loth to purchase more artificial food than is absolutely necessary, or to continue that expensive process too long, and when the cows can get herbage he is only too glad to make use of it. I do not think you can blame him for that, but the effect is to lower the quality immensely.

7032. Have you any figures from your Dairy Institute which you could produce?—I have not brought any figures here, but I have often noticed that the standard falls below 2·8.

7033. At that time of the year?—Frequently; I have tested it repeatedly, and found it to be so.

7034. Do you contract with farmers to supply your Dairy Institute?—Yes, with several farmers

7035. Do you stipulate that a certain quality shall be provided?—We have made a rough stipulation with them that there should be 10 per cent. of cream—but it is very elastic.

7036. Ten per cent. of cream?—Yes, that milk showing less than 10 per cent. of cream shall not be considered as of good quality. That is our general clause, but, of course, that is an unscientific test; it is cream, not butter fat.

7037. By weight?—No, by measurement. If we find it is like that, we apply other tests. If we have reason to suspect it we use Dr. Gerber's test, which seems to me as reliable as anything next to direct chemical analysis. I had one case, a most glaring case, that I was sure was very much below the standard. I was certain the milk was watered, I followed that case up, and it is very interesting to show that the farmer is sometimes not to blame. It had been standing at a country railway station. The Great Eastern country stations are not all strong enough for their fast traffic, and in this case the troughing was out of order and there had been a shower of rain, and the water had actually poured off into the can. I have no doubt that was so. I have seen some cases since myself. You can occasionally have an accident of that sort.

7038. But we cannot put the standard down for that milk?—No you cannot. I have not the slightest doubt in my own mind that there are, especially at the period I have named to you, frequent cases where the milk does fall below that standard—even below 2·8. If you put the standard at 3 per cent. you will include a great many more, and I am afraid you will cause hardship to very many consignors. I may say that the milk trade from the Eastern Counties has very much increased in the last few years, principally through the immigration of Scottish farmers. We have had a large number of Scotch farmers during the last twenty years come into the Eastern Counties, and they have taken up the milk business in Essex, and I think have led the way. I think they have set our native farmers rather an example, because they seem to understand their business thoroughly well. I mean they thoroughly understand the production of milk, and they do it very cheaply, because their families do nearly all the work themselves. They have certainly very much increased the output of milk from the Eastern Counties to London. I find that there is an increasing tendency for the farmers in the neighbourhood of a railway station, and where they are convenient for the rail, to send milk to London, and, on the whole, I believe they find it more profitable to dispose of it in that way than in any other way. Of course, that only applies to those who are tolerably convenient to a station.

7039. I suppose you know now that those farmers who are beginning to send their milk will have their milk subjected to a test of 3 per cent. for fat, and 8·50 for non-fatty solids?—I hope it will not be 3.

7040. It is 3 now?—I hope it will not be so much as that, because I do not think 3 is actually in force.

7041. We understand it is, and that they have to run that gauntlet?—If anything showed 2·8 I do not think any prosecution would follow. I believe that is how it now stands in our district.

7042. You say in winter the worst quality is produced in certain areas?—I have not said much about the winter. There is this difference in the food of the winter, some farmers will grow a quantity of mangold wurzels or beetroot, and if the cows are fed on beetroot and brewers' grains you will get a poor quality of milk.

7043. That you would consider an improper way of feeding a cow to produce milk, would you not?—I should not like to say that it is an improper way. Of course, a farmer must be allowed a certain amount of discretion. He is anxious to make as much quantity as possible, no doubt about it, and that is why I say I should like to see a standard fixed, and why I should like to see milk bought according to its value. I strongly advocate that, though I am afraid that in saying that I am rather in advance of public opinion. I do not think you will get farmers really to agree to it, but I hope a time will come when it is done—perhaps I had better put it in that way. I hope the time will come when milk is bought according to its value.

7044. In point of fact as regards winter you say it is really a question of feeding?—It is very largely a question of feeding; there is something in breeding, of course.

7045. Breeding and feeding?—Yes.

7046. We have had in evidence the analyses of an enormous number of winter milks, and as a rule I am bound to say they show very good results; generally speaking, throughout the country the farmers treat their cows very well throughout the winter, but there is no doubt there are instances that you know of where what I ventured to call improper feeding is carried on?—Of course, it is a matter of opinion whether it would be improper feeding when you feed on beet and mangolds.

7047. And brewers' grains?—Yes, mangolds and brewers' grains. I mention that to show what is done sometimes. I believe the majority of farmers in our district are careful to add more nitrogenous food, and do feed better. I do not think there are many instances where the milk would fall below 3 per cent. in the winter months.

7048. (*Mr. Farmer.*) That sentence in your *précis* reads a little doubtfully: "In winter the worst quality is produced"; you do not mean the worst quality is produced in the winter?—No, there must be something wrong with the commas there. What I mean is that the worst quality is produced by the use of mangolds or turnips, without dry or nitrogenous food.

7049. (*Chairman.*) What I ventured to call improper feeding?—That, of course, is a matter of opinion. From a consumer's point of view you might naturally say so, but then I say this—the farmer must be supposed to know his own business best, and if he is paid for his milk by the gallon he is naturally anxious to get as many gallons as he can fairly get into the can; you cannot blame him for that.

7050. Still under the Act he has the power of showing if his milk is under the standard that it is genuine milk from the cow?—Yes.

7051. In the first instance the presumption is raised against him unless the contrary is proved, therefore he would be quite safe under the present law by taking the inspector down to see the cows milked?—Yes. I do not wish to shield the farmer or anyone else. Of the members of my Chamber there are about 150, chiefly farmers, many of them engaged in milk production. They are very anxious that the standard should not be fixed too high, because of throwing the onus on them. They think they would incur a considerable odium and expense in defending any unnecessary action of that kind, though I believe as a rule they are anxious to produce the milk up to a fair standard. To a certain extent it is to the interest of the seller, because he would get more competition for his milk if he has milk of a pretty good quality.

7052. (*Mr. Murphy.*) I understand you do not object to a standard?—No, I do not, though I quite see the difficulty of it. I understand that it is the object of this Committee to fix a standard.

7053. (*Chairman.*) To recommend one?—I beg your pardon; yes.

7054. (*Mr. Murphy.*) Your difficulty is what that standard should be?—Yes.

7055. What would be the effect of a reasonably high standard if such a one were fixed? Would it mean that certain farmers would have to alter their methods?—Yes, that might be the tendency of it to some extent; no doubt it would to some extent have that effect.

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7056. As apart I mean to say from actual adulteration, or anything of that sort, some of them might have to alter their methods?—Yes.

7057. Some of them might have to improve the breed of their cows?—Yes, and feed higher.

7058. What is there in the management of a dairy farm that could be done by a farmer to improve his milk?—I should say, of course, purchasing nitrogenous food, such as cotton cake or pea meal, or bean meal—I mention those three as well-known foods—and giving them a large proportion of that. But then, of course, you will increase the cost of production; there is that to remember.

7059. Then there is the quality of the animal?—Yes, I think that the habit that has been taken up during the last few years, of purchasing pure-bred Shorthorn bulls has had a very good effect. We have had thousands brought into the district, principally through the enterprise of one auctioneer.

7060. Do you think if a standard of something over 3 per cent. of butter fat, and something over 8·5 per cent. of other solids, were fixed that that would require more than such changes as you have just spoken of?—Sometimes. You see even if every precaution is taken as regards feeding there are certain circumstances that may arise which will lower the standard. Of course, the more you do by the addition of nitrogenous foods and improving the breeding, the more you will heighten the general average, but I do not think it would be safe, taking everything into consideration, the climate and the exigencies that we have to submit to in the Eastern Counties, to go higher than 2·8 of butter fat, though I think 8·5 perhaps of solids not fat might be admitted. I do not think you ought to be higher than 2·8 in regard to the butter fat; in fact I know that a great many samples of milk would be condemned if that were the case.

7061. A standard has been suggested of 3·2 of butter fat and 8·8 of solids not fat, giving a total of 12 per cent.?—I think that is too high. I think you forget how very poor our pastures naturally are. Unless one has seen them I do not think anyone would realise that. I have been in the Midland Counties, and the contrast is most painful to me.

7062. Do you think a standard of that sort would require more change than an improvement of breed and attention to the feeding?—Yes, I do.

7063. What would it imply—that certain lands would have to be abandoned?—I think some lands would have to be given up entirely for that. In the district lying between Saxmundham and Beccles, which is a very poor heavy land district, there are a large number of cows kept there, and they are principally owned by Scotch farmers. The farms were left derelict, and abandoned several years ago, and the landlords advertised in the Scotch papers, and many Scotch farmers came there. There is a whole colony of Scotch farmers there. They are doing very well with the cows, many of them being Ayrshire cows, which give a fair quantity of milk. I think the Ayrshire cow is specially rich in solids. Those Scotch farmers are doing very well, and I think it would be very unfair to draw the net so as to catch such men as they.

7064. Do you think they are not coming up to the standard now?—There are times when I think it falls below 3·2 certainly, if not below 3 per cent. I should think it would be a great mistake to put the standard too high.

7065. Is that within your actual knowledge, that they are supplying milk which is below that standard from time to time?—Occasionally the milk does fall below that standard, because I know—I have had samples myself brought under my notice.

7066. Would that occasion be when there is some particular weather condition?—Very often it is. I think it is an undoubted fact that a very cold night, for instance like we had last week, does affect the milk. There is not the slightest doubt that the cow provides for herself first, and that a portion of the fatty matters in the food, the carbonaceous matters, go to provide fuel for her own system, and to supply her own natural wants, and then, of course, there is less goes to the pail; there is not the slightest doubt about that.

7067. Do you think that a particularly cold night would reduce the quality of the milk below that stan-

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dard?—Yes, it would. That is a circumstance that would affect it seriously.

7068. And do you think that milk would frequently come below such a standard owing to some change in the weather?—Yes, owing to a change of weather and food.

7069. And food?—And food as well.

7070. What I want to get at is whether apart from food it is due to causes which the owner of the cow cannot control?—When you get the two together—when you get a combination of circumstances—that is when this is apt to occur. Take, for instance, that night last week. I believe that the frost extended as far as Jersey. With us it was very serious; it cut off young vegetation, and the cows out that night, having been recently turned out, there is not the slightest doubt that their milk the following morning would be exceptionally poor.

7071. Do you think it would be below such a standard as that?—Yes, I do.

7072. Do you think it would be below a standard of three per cent. butter fat?—It is certainly below 3·2. Of course, when you come to the point of asking whether it is 2·8 or 3, I say I think 3 would be unsafe.

7073. Do you know of any observations having been actually made showing the effect of a sudden change?—Yes, I have noticed it myself in milk that comes into our own dairy. There has been a considerable change.

7074. Have you had it analysed?—Yes, we often take samples, and I have noticed that after a cold night there is a falling off in both quality and quantity. I have noticed that the difference in quantity is from 5 to 10 per cent. after a cold night, and that there is a corresponding fall in the quality.

7075. Bringing the butter fat down to what?—It often comes below 2·8 then, or even below that—2·6 and 2·7; I have often tested to that. As I have said in my précis, I think the Red Polled cow the best breed, and it would yield four per cent., but the general average would not be more than three.

7076. Of course, whatever standard you have there would be a fall, and a fall of perhaps so much per cent., but it must begin with a very low standard if it is going to be brought down to 2·7 or 2·6?—It is very low at this period of the year under any circumstances.

7077. It would imply that the standard was a very low one if the loss of 10 per cent. could bring it down to 2·7?—It is a low one at this period of the year.

7078. I cannot quite understand how it would come down to 2·7 if there were a loss of 10 per cent. on a change in the weather unless the average standard of milk is an exceedingly low one?—It is at this period of the year. I think this week and the next week will be the lowest standard we shall probably have.

7079. That is the result of a change of food or what?—It is the result of a change of weather and cold nights. We are having very cold nights, with cold easterly winds at night.

7080. If that were so, I suppose that condition would show itself in all milks examined over a large tract of country?—Yes, it would.

7081. It would not be limited to one section?—It would be poorer in the Eastern Counties, where we are more especially exposed to the east wind.

7082. But it must be manifest to people who are making examinations of milk from, say, a whole county, that the samples they are receiving do fall at such a time?—Yes, I believe so.

7083. Supposing the samples of milk from farmers generally were maintained in quality, and a particular farmer's milk fell in that sort of way, what would you say?—Of course, there is such a difference in the treatment. Some farmers have covered shedding to keep the cows in almost entirely, and some would continue giving them dry food longer. Some, in fact, bait their cows all the year round; I know there are some who do that, but they are the exceptions rather than the rule.

7084. Do you think that an analyst receiving a sample of milk would be able to recognise the effects of a change of this sort?—Yes; I have not the slightest doubt that if every sample of milk delivered into the Liverpool Street Station, say to-morrow morning, were examined, there would be found great variations according to the feeding and housing of the cows; and also that in the case of a very large quantity of it, where the cows were recently turned out to grass at this season of the year, the quality would be found to be below the normal.

7085. If that knowledge of change of weather were centralised it would enable an injustice to be prevented in the event of particular prosecutions?—Yes. From my knowledge of the milk supply of the country I feel sure that you would find now at the present time quantities of milk coming in perilously low—genuine milk.

7086. (*Chairman.*) Do you consider it a good policy to keep cows out on these cold nights?—No, I do not; but what are you to do?

7087. Why do they do it?—One reason is this, that some cow-keepers have not buildings suitable to keep them in; another reason is that they have no litter left—the straw and fodder is all gone; they have used up their straw and their hay, and, as I say, they have for a long time been drawing on their resources to buy food. It is a very serious position for a farmer when he is not in a position to go on constantly sending his cart to the merchant for corn and artificial foods. A spring like this is a period of great anxiety for a farmer.

7088. (*Professor Thorpe.*) You are aware that this is a Committee which has been appointed by the President of the Board of Agriculture?—Yes.

7089. That the Board of Agriculture has vested in it the interests of agriculture in this country?—Yes.

7090. Therefore inasmuch as you have told the Committee that these conditions which tend to depreciate the quality of milk are all due in your opinion to imperfections in the mode of managing both the beasts and the farm, surely you cannot ask this Committee, appointed by the Board which has the interests of British agriculture at heart, to recommend what is a low standard, and inferentially a low character of farming work?—I do not admit that they are all caused by carelessness or indifference on the part of the farmers. I was particular to point out that the climate has a great deal to do with it, and that is a matter which is quite independent of us.

7091. You told us that first the quality of the breed ——?—Yes, that has very much to do with it, no doubt?

7092. The character of the feeding?—Yes.

7093. The inadequacy of the protection?—Yes, these are all causes that have to do with it; I quite admit that.

7094. Those are all conditions, of course, which the farmer has more or less control over?—Yes.

7095. Then, that being so, you cannot ask us to recommend to the President of the Board of Agriculture inferentially a standard which is related to or is connected with or is dependent upon conditions of this character?—You see, we cannot expect to get very near up to a standard of perfection; if we could it would alter things altogether.

7096. Yes, but you could surely set an example?—I know, but on your action will depend a very serious question, because you do not wish to take any action, I presume, that would cause a lot of honest farmers carrying on their trade as they should do to be put to the ignominy of police-court proceedings unnecessarily.

7097. No, but what we want to do is to bring about a condition of things which would eliminate those things which, on your own showing, it is desirable to have eliminated?—I quite agree with you so far, but, mind you, I do not wish for one moment to lower the standard in any way more than is absolutely necessary. As far as I am concerned, I want to do everything I can to encourage the farmer who has good buildings, and the landlord, who puts up good buildings and all that sort of thing, and the farmer who studies the comfort of the cow.

7098. The natural effect of a reasonably proper standard—I will not say a low standard, but a reasonable standard—would be to eliminate those exceptional conditions which tend to depreciate the quality of the milk, would it not?—Yes, it would have that effect to some extent, no doubt.

7099. (*Mr. Barham.*) You mentioned a little while since that if a high standard were fixed, and by reason of that discredit was brought upon the honest producer, that would damage the law very much in the eyes of the public generally?—It would—no doubt about it.

7100. By bringing great discredit upon it?—Yes, it would tend to bring the law into contempt, and also to discourage those farmers who were trying to produce milk.

7101. It seems to me that in either case it would bring the law into contempt. Tell me whether this is so or not. Supposing that a farmer were summoned for selling adulterated milk and he proved his innocence satisfactorily, and the case was dismissed, would not that bring great discredit upon the action of the local authorities as well as upon what this Committee has done?—It would to some extent, whether he was found innocent or guilty.

7102. I mean if he proved his innocence it would bring discredit upon this Committee and upon the Board of Agriculture; and, on the other hand, if he was unsuccessful in proving his innocence and was convicted of selling adulterated milk when the milk was actually pure, that in itself would bring immense discredit?—It would; of course, that would be worse still.

7103. (*Mr. Cowan.*) Are there many large herds of dairy cattle in the Eastern Counties?—I do not know quite what you would call a large herd; there are not many that have fifty cows in a herd.

7104. Is there a large number of cows?—Yes, there is a large number of cows kept.

7105. Are they principally Red Polled cows?—They are Red Polled or crossed with the Shorthorn.

7106. You seem to have no difficulty from those Red Polls in having a very high standard before you?—No, I mention the very best herds; those herds that I have mentioned to you are I believe the best. As I have said, they represent the high water mark really.

7107. You mean they are the best so far as the breed is concerned?—Yes, and the management. I know a little of the management of those herds; they are exceedingly well managed, and the cows are bred with very great care; they are pedigree cows.

7108. Is there not a tendency in the Eastern Counties, when they have such an object-lesson as that before them, for the farmers to go in for Red Polled cows and for managing their stocks better?—There is; with some, of course, it has had an influence, and a good influence, no doubt. Of course, it has had some influence on the district, but they are not generally kept up to that standard or anything like it.

7109. Are there many crossbred cows in the dairies in the Eastern Counties?—Yes, nearly all the cows are crossbred.

7110. And they give a much lower quality of milk?—Yes, they do.

7111. Are they lower in quantity as well than Red Polls?—No, I think not. I think they give rather more in quantity, especially where the Dutch cow has been introduced. At different times we have had breeds of imported Dutch cows there, though not, I believe, at the present time; but they have been introduced into the district during the last twenty years.

7112. With the object of increasing the quantity?—Yes, undoubtedly.

7113. At the expense of quality?—Undoubtedly.

7114. May I ask if those crossbred cows are kept as being more valuable for feeding purposes? When they go out of the stock, is that the reason that those crossbreds are kept?—No. I think the cross has arisen generally by the introduction of Shorthorn bulls, and until recently I do not think our farmers appreciated the value of a pure-bred Shorthorn bull. I mean they picked up a Shorthorn anywhere on the markets, perhaps even an Irish-bred animal, but lately I think they have appreciated the importance of getting the very best possible sires they can, and they are willing to pay a higher price for them, and they have done so.

7115. Is dairy farming the principal industry in the Eastern Counties?—No, corn-growing; but, then, corn-growing is declining.

7116. I mean so far as the stock are concerned?—No; grazing is more important, or has been more important, than dairying.

7117. In the case of those dairies that you speak of, I suppose it would be the principal industry with those farmers?—Yes, they have devoted their principal attention to those dairies.

7118. Why do those farmers keep cows that only produce 3 per cent. of butter fat and no more when they have such an object-lesson as you have put before us?—I have no doubt that those cows are maintained at a very much larger expense than the others. I believe in those three herds that I have given you—Mr. Garrett Taylor's, Mr Harvey Mason's, and Mr. Alfred Smith's—there is no expense spared in the care and management in order to make a good record.

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7119. But we will suppose that it pays them?—I have no doubt it does.

7120. They use a good deal of artificial food in the winter and the spring?—Yes.

7121. And possibly even on the pastures?—Yes, I believe everything is done to promote the comfort and the record of those cows. They get both quantity and quality, and they are certainly object-lessons.

7122. If that is so, why should the other farmers—they are all practical men, we will suppose—not use artificial feeding when it would certainly be to their advantage?—There are various reasons for it. Other farmers, perhaps, have not got so much intelligence, and they have not got so much capital, and they have not got such good farms or such good buildings.

7123. But you see, their land would be very much improved if they did farm it intelligently?—Of course, that applies to everything.

7124. I noticed you spoke of a colony of Scotch farmers going there?—Yes.

7125. They got into poor land, did they not?—Yes, most of them took poor farms that nobody else would take; they took them at a low rental.

7126. And put dairy cows on them?—Yes, and I believe they have managed fairly well.

7127. Would you consider that it is their extra management that has been the cause of their success?—A great deal of it is. They have managed generally without hired labour, with their own families; they all work, and they are very frugal men. I am speaking of them as a rule.

7128. They only got into the worst class of land in the Eastern Counties, I take it, when it went down?—What tempted them, I know, was the fact that the lands were abandoned.

7129. Derelict?—Yes; and they were advertised very largely in the north country papers.

7130. Are they principally Ayrshire cows that those men have?—Yes, principally; but some of them have crossed them with the Shorthorns, and I believe the Ayrshire cows have depreciated a little bit since they have been down there. I think the climate has been rather against them. We have a harsh, dry climate.

7131. Have they been able to produce milk to meet the supposed demands of Somerset House?—I believe they have kept within that standard. As I have said, the Ayrshire cow is rich in solids.

7132. Is it equally as rich in butter fat as the Shorthorn?—Well, perhaps it is.

7133. Do you think it would be poorer land that they would get in possession of down in Essex, than we have in Scotland?—Yes, undoubtedly. When I visited Ayrshire—and I am speaking about Ayrshire, because I do not know other parts of Scotland—I thought the land in the Eastern Counties is nothing like equal to the land I saw in Ayrshire.

7134. You say the climate has a considerable effect?—Yes, the climate is much more harsh there from what I could gather than it was in Ayrshire when I was there.

7135. Do you not think we have in Scotland as hard and variable a climate, and as bad a climate altogether as you have in the Eastern Counties?—What I saw in Ayrshire was that you were growing potatoes when our potatoes were blackened by frost.

7136. You would find that was on the borders of the Irish Channel, where we have the sea air from the Atlantic and the gulf stream?—Yes, it was probably.

7137. Then it is rather surprising to find that with your poor land and bad climate that you have your cows out at night already?—Yes. One reason for that is that as I mentioned the litter is all gone, and probably the last stack of straw has been used. There is no litter probably if they are kept in, and even if the farmer has shedding. But there are some herds that lie out all the year round—they are left out all the year round, although I do not think it is wise.

7138. I suppose the cows suffer considerably by being out at night, especially cold nights?—Yes, I am of opinion that is so.

7139. That is done because you have no feeding for them in the house, is it?—That is the principal cause.

7140. Would not they be better under shelter, even if they had no feeding—we often have that in Scotland?—Without bedding?

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7141. Yes?—But it is difficult to keep them clean under those circumstances.

7142. We have had as many as 100 of them tied up on a stormy night, and without any bedding?—We have not got the proper facilities.

7143. You should change your system of farming?—That is a landlord's question.

7144. Do not you think a great many of the circumstances you have given us are altogether under the control of the farmer?—No, I am afraid not.

7145. A great many of those circumstances that you speak of are surely?—You see the farmer is placed in great difficulty. Some land which he hires for five shillings an acre is poor land, and how could he go and ask his landlord to lay out sums of money on buildings on it?

7146. Certainly not, but he should not put on dairy stock there?—No.

7147. Would you advocate selling by quality?—Yes.

7148. Is there anything of that kind done in your part of the country?—I have often offered to take contracts in that way, but farmers do not seem to like that system. I suppose they are afraid that they will not do so well as they would otherwise. They seem very reluctant to take up that, and if I went on the market and offered to buy milk only by quality I question whether I should get any milk offered me.

7149. It appears to me that farmers in your part of the country require grading up as well as the cattle?—Perhaps we all do.

7150. You are aware the milk is sold by quality in certain districts, are you not?—Yes. I do not know that it has been taken up to any extent.

7151. Do you know it is done in some parts of the country, and not in others?—In certain instances it may be so, but it has not come under my personal observation, as I should like to see it, by quality.

7152. You speak of calves getting milk from the cows generally, but it must deteriorate the milk?—No, doubt it does if a number of calves are kept on, because if they take the last strippings from the cow generally speaking the milk is reduced.

7153. The calves generally get it first, and it improves the quality then?—It would then, but it is not done generally where they send milk to London.

7154. It is done in our part of the country?—As a matter of evidence the general habit is the other way about.

7155. What kind of cows supply your Institute?—Mostly Red Polled cows.

7156. Do you know the analysis of milk supplied to the Institute?—I cannot give you the analysis, but we often take them, and find the Red Polled cows are better—in fact we give more for milk from a Red Poll than others, because we know their milk is richer.

7157. If the standard was fixed at a fair thing do not you think it would be quite easy for the producer to increase the quality of his milk by judicious feeding and breeding?—In some instances, but not in all—not generally speaking, I think.

7158. Why should the standard of milk produced by the country be fixed, according to the milk that is sold by the very poorest farmers in the country?—I would not do that. I think with 2·8 you would not do that.

7159. Do you think there would be any difficulty in producing 3 per cent. for the whole season in a large herd?—No, possibly the average would come to that, but there are times in which you do fall below that, and in those times the farmer would of course run a serious risk.

7160. There is no occasion for it to fall below that with a mixed herd, is there?—Under the circumstances which I name it would.

7161. But you would not suggest the standard to be fixed by the poorest farming in the country, would you?—No.

7162. Then it might be a hardship to the innocent man you say if a fair standard was fixed, or if the standard was 3 per cent., but do not you suppose that if there was a certain time allowed before that standard came into operation the farmer, seeing that a certain standard was fixed, and that he must grade his milk up to that, or go out of the trade, would be able to do it quite easily?—It would certainly be a mitigation if 12 months were given, of course.

7163. Why so much as 12 months?—Of course if farmers were compelled to raise their standard I think they ought to have a considerable notice, because they have to make arrangements accordingly. For instance, I think they would have to keep their cows under cover longer than they do now.

7164. Have you much knowledge of adulteration?—I do not think adulteration is practised. It is very rare indeed in which there is any adulteration at the farm. I do not know about London, but as to the small towns, when it passes through 3 or 4 different hands in the little milk shops in the back streets, it is there it takes place. With the farmers it is first hand almost invariably. I do not think the farmers could practise it. People would see it and know it. Where mischief is done is where it passes through different hands and down the back streets, or when the man goes round with a handcart.

7165. Do not you think the retailer might be an innocent man too when caught?—The temptations are very great when several profits have to be obtained from the same article.

7166. But have you any idea of the change that would take place in the milk between the time that it leaves the producer and the time it gets down to the retailer where he puts it into small pans and sells it out in very small quantities—have you any knowledge of that?—I think there is a very great temptation.

7167. But do you think his milk would be very much reduced without temptation, he being perfectly honest?—It would depend upon whether he dipped it at the top or bottom of the pan. That would have an effect, and of course the cream being taken off would have an effect. There is great temptation when somebody wants to buy cream of him for him to take a little cream off.

7168. I suppose personally you would not be inclined to advocate above 2·8?—No, that is my feeling. I admit the great difficulty of the whole subject, but I have thought it over very carefully, and I have talked it over with our members, and that is the general feeling with them. Many are opposed to any standard at all, and others think that is the only standard consistent with safety under present circumstances.

7169. Have you any idea whether farmers themselves would prefer a standard?—No, I have not heard of one advocating more than that, and I have talked it over with several.

7170. Are there many Scotch members of your Society?—There are several.

7171. Do not they advocate a higher standard?—No, not quite, I think, in fact the general feeling is that it is such a difficult question that it is best left alone. That is what their feeling is, but if a standard is really fixed their feeling is that 2·8 is sufficiently high.

7172. (*Major Craigie.*) You are the hon. secretary of the East Suffolk Chamber of Agriculture, and secretary of the Eastern Counties Dairy Institute?—Yes.

7173. You have attended at the Central Chamber in that capacity as deputy, I understand?—Yes, we have two other deputies now. Mr. Everett and Mr. Biddell are our deputies now.

7174. You have not been to any of their meetings lately, have you?—No.

7175. In the case of the Suffolk Chamber, is there a large proportion of their members interested in dairy farming, or only a small proportion?—A large proportion; perhaps not the majority, but there is a considerable number of them interested in dairy farming.

7176. There are more now than there were ten years ago?—Yes, there are.

7177. There are other Eastern Counties bodies with which you are connected with, I know. Have you had there any meetings or discussions with the governing body of the Institute which touched upon this subject?—We have often talked the matter over, and it has been my duty as secretary to report milks that are low, and that has formed the subject of discussion. Then the question of price comes in if it is low in quality, and we have decided to give so-and-so one halfpenny a gallon more, for instance, because the milk shows a good return.

7178. Do you vary your prices?—Yes, we do sometimes, and naturally when we are looking out for a fresh dairy we have to pick out that which is shown in the past to have produced goods of better quality. I mention that as regards a Red Polled dairy that is in my mind now.

7179. But you do not buy on the scale suggested?—

No; I should like to do it, but we should have no milk offered if we insisted on that.

7180. Have you ever had before you the suggestion that there might be milk standards of different grades for different qualities of milk and different prices?—Yes. If the milk of so-and-so gives 3 per cent., or of so-and-so 3·2 per cent., then my idea is that it should be so; but I have not drawn up a scale myself, but I think a scale could easily be drawn up.

7181. Would you like to see milk sold by quality and ratio of fat and solids?—Yes. One could easily draw a scale of that kind, but at present English farmers will not hear of it apparently.

7182. Would you suggest that milk should be sold as prime milk, and secondary milk, and so on?—It would be rather invidious to draw those distinctions, but it should be milk guaranteed to be of a certain quality, naming it whatever it might be.

7183. But that is not practised?—That is not practised at present, and unfortunately, the producer does not seem willing to take up that idea.

7184. Has the Suffolk Chamber ever discussed the question at any meetings at all of the standard of milk?—No, they have had no public meetings about it. We have only brought it before the Council, but I have made private inquiries amongst our members who keep a number of cows. I wrote them after I knew I was coming up here to get their views on the subject.

7185. Have you seen reports of other dairy farmers in the Eastern Counties within the last few months?—Yes. I noticed one at Chelmsford. There is a milk-producing association there or a combination. I forget what their conclusion was.

7186. There is a milk combination for the Eastern Counties, or, rather, one of the associated bodies in connection with the central body called the Eastern Counties Association?—Yes, but I have no connection with them. I think their main object is to raise the price of milk.

7187. You know of Mr. Primrose McConnell?—Yes.

7188. He has recommended a standard of 3 per cent. of fat and 8·5 per cent. of solids not fat?—Yes, but I have not seen his evidence.

7189. You would not agree with that, would you?—I think 3 is rather too high. That is my opinion. The district where Mr. McConnell lives is rather a better district than with us. It is a rather more fertile and sheltered district.

7190. You say that the question of standard would be rather a question of district then?—It has something to do with it, of course—necessarily.

7191. And you say that the ideal standards would be different for the different districts?—It would be almost impracticable to do that, but it is certainly the fairer and more just way, although I do not see how you can practically bring it about.

7192. Then we had before us from the Eastern Counties yesterday Mr. Alexander Steel, secretary of the Eastern Counties Dairy Farmers' Co-operative Society?—Yes, and he recommends that.

7193. He recommended even a higher standard—3·20 and 8·80?—Yes. The Association he represents have as their main object to raise the price of the milk, I believe, and to keep a high standard. That is a combination.

7194. They were willing to assent to or recommend to us a higher standard. What do you say to that?—That is his suggestion.

7195. That is because they would rather level up the quality of the milk?—Yes, there is no doubt about that.

7196. You are aware of the exact wording of the clause under which this Committee is sitting, are you not?—Yes. The reference was sent to me, I think.

7197. It is not to establish an absolute standard, but only a standard which shall raise a presumption till the contrary is proved?—Yes.

7198. That is to say, in the case of any milk of the character that you have been telling us of in certain months and from certain herds being impugned, there will be an opportunity for the owner to show that this was pure milk?—Yes, and it is on that reference that I have given my evidence really.

7199. Notwithstanding the fact that conviction would not necessarily follow, but only presumption, you would still keep to your view that 2·8 is high enough?—Yes, I think so.

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7200. You think that the question should not be discussed at all after that level is got?—No, I think not. If you do more I think you will discourage a great many honest men, and put them also to considerable expense, and throw unnecessary odium on them.

7201. I notice you said, in answer to Mr. Cowan just now, that a good many of your neighbours were opposed to a standard at all?—Yes. They think it is very difficult to fix it, and that is the reason given to me.

7202. Do they mean by that there should be no prosecution at all?—I do not know.

7203. Or do they mean there should be no gauge according to which a prosecution shall be started?—Several that I have spoken to think it is so difficult a job that you cannot fix a standard.

7204. You are aware there is a standard fixed at the present time, although not by an official regulation?—Yes, but it has not been officially recognised in my neighbourhood. There have been very few prosecutions except the few in the town of Ipswich, which were quite called for. They were brought about by insane competition, which was a mistake.

7205. The farmers then think the subject should be left alone?—That is the idea.

7206. And that different rules should apply in different parts of the country, and that there should be no uniformity; but that there might be different standards, one of 2·8, another of 3, and so on?—Yes, that is their opinion. I cannot say I share that opinion altogether myself personally. I think that if you fix a standard, and do not fix it too high, it would be desirable to have a uniform standard.

7207. In fixing it as low as you suggest, you do not think you would run any danger of making it too low, do you?—No.

7208. You did not refer in your evidence in chief to the percentage of solids not fat?—No. I have had very little experience of that except in the matter of cheese-making, and there, as I have mentioned, we deal with it practically, because we keep a strict record of every cheese we make and the amount of milk which is used, the curd produced, and how much when dry, and so on, and we can always refer back to that. I have been very much interested in that record, to notice the great variation there is, and, of course, we have made experiments with different foods that we have given, and in every single instance we have found a most beneficial result from the use of nitrogenous foods. We find that the farmers are fully repaid their outlay if they intend to make a cheese on nitrogenous foods. Even in the summer, when farmers have the cows out in grass, we find it better for them to use nitrogenous foods and increase the solids in the milk, and so to some extent to increase the butter-fat as well. The casein, or cheesy matter, in the milk, is wonderfully increased by doing so. We did that to bring up our cheese record to what it was in other counties, and we found we could overcome by that to a great extent the natural poorness of our pastures. I am bound to say that is so.

7209. Then I see you lay a great deal of stress on the improvement that has been effected already by classes and teaching?—Yes, that is so, and in Norfolk, at a village called Tacolnestone, where we have had two classes two years in succession, that fact has been brought prominently to notice. I went over two farms to see what had produced that effect, because some of them yielded so much better than others, and I found the difference was only to be accounted for by the fact that they were using cotton-cake on that particular farm.

7210. Then you do not at all despair of teaching farmers to improve their milk by means of education, and you prefer such educational means to a possible restriction of the poorer milk supply by means of prosecutions?—Yes. I think, if the idea got abroad that you prosecuted farmers in order to make them feed their cows better, it would have a mischievous effect, and I should very much object to that idea.

7211. Are we to take that as the view, not only of yourself, but of others in the neighbourhood of the eastern counties?—Yes.

7212. What do you say as to the opinion of the Central Chamber and other authorities that recommend higher standards?—If you refer to the evidence of Mr. Wilson Fox, who went round the eastern counties, I think it will very much bear out what I say with reference to that.

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7213. I only want to get this on the notes, that the conditions of your immediate district are so very much poorer than the rest of the country that you recommend the general standard to be accommodated to that, and that you could not contemplate the idea of different local standards?—I do not know about that. It seems impracticable to do it. Those who advocate it have the good lands. I do not suppose there is any district where the land is so poor as the district I represent—not so near London, at any rate.

7214. Do you know that these analyses have been made by public analysts?—I know Mr. Harvey Mason's man and Mr. Garrett Taylor, and they are careful men, and these are the public records, and the information with reference to the herds is to be found in the Red-Polled Herd Book.

7215. Do you know the process of making the analysis?—No, I am not quite sure about that. In our case we use Dr. Gerber's tester.

7216. Do you use the Babcock test or the Lacto-butyrometer?—No; we prefer Dr. Gerber's.

7217. (*Chairman.*) Do you farm on your own account?—The Institute does. We farm about 400 acres.

7218. But you have no private farm?—No; only in connection with the Institute. Of course, we produce a quantity of milk ourselves.

7219. Do you test that?—Yes, frequently, as well as others.

7220. Would you be afraid of the 3 per cent. of fat?—No; because we always give them some artificial food. We keep them well.

Mr. C. Prideaux.

Mr. CHARLES PRIDEAUX, called; and Examined.

7221. (*Chairman.*) You have come up from Dorset to tell us your experience of working the milk and cream trade, in which you have been engaged for upwards of 15 years?—Yes.

7222. And you have been engaged in milk, cream, and butter factories in the county of Dorset?—That is so.

7223. Are you manager?—I am the proprietor of the butter factory and joint proprietor with my brother of the milk and cream factories. I have a butter factory at Motcombe, of which I am proprietor, and milk factories at Motcombe, Stallbridge and Shillingstone, in which my brother and myself are partners.

7224. What do you call a milk factory?—That is where we receive milk, and separate the cream from the milk, and send the milk or cream away to customers in large towns, or simply the milk, whichever we have got orders for.

7225. You divide the milk into cream and separated milk?—That is so.

7226. And you have customers for the two classes of goods?—Yes, for the two classes of goods.

7227. You say you receive from farmers one and a-half millions of gallons of milk per year?—That is an estimate. I took the figures 12 months ago—not last year—but I should say it is more like 1,800,000 gallons—it is more than I have said.

7228. Quite half of that is separated for cream and butter?—That is so

7229. The other half will go for pure whole milk?—Yes. We do a large trade in accommodation milk towards the end of the week, when there is extra new milk required. We separate or supply the new milk.

7230. Then I see you were naturally struck on looking into the quality of the milk, to see how much difference there was in quality in the various deliveries?—Yes, that is so.

7231. Then you began to sample or to test the milk supplied, by the Gerber test?—Yes.

7232. In the morning and evening?—Yes.

7233. Perhaps, before telling us your experience in that way, you will tell us, do you buy your milk under contract from the farmers?—We do.

7234. Have you any clause in your contracts about quality?—Twelve months ago we put a clause in the contract that any milk showing less than 3 per cent. of butter fat would be paid for at a reduced price.

7235. Did you go into the solids?—No. I am only interested in the fat. I found in actual practice that clause was a mistake.

7236. In what way?—Because 95 per cent. of the milk produced more than 3 per cent. of butter-fat, and therefore it left an opening for the farmer to say at once, "Well, I will supply you milk of 3 per cent. of butter-fat, and you must not complain," whereas, if we put it that we want pure milk or milk showing the average per cent. of butter-fat over any particular time, we should get perhaps 3·75 or 4. I found that did not act at all, because we get in the winter time milk from about 120 farmers, and we should get 100 of these farmers showing an average of 3·50 or 3·60 per cent. of butter-fat, and another 20 farmers down to 3 per cent., or a trifle less, or over, and we should think at once this milk was not up to standard, and there is something wrong here—this milk is not worth so much as the other. Then we should complain, and say, "Why does not this milk show the proper percentage of butter-fat?" The farmer would say, "It shows 3, and that is all my contract asks for." Therefore, I have struck that clause out, because I am strongly of opinion that 3 per cent. acted prejudicially as regards the quality of the milk.

7237. What is your new contract?—Our new contract is that any milk delivered showing on analysis less than the average percentage of butter-fat will be paid for at a reduced price.

7238. But who is to decide what is the average?—We decide. We are prepared to show our list to farmers and the test, and the result of the milk each day, and then, if we get 95 farmers' milk that shows 3·75 per cent. or 3·60 per cent. of butter-fat, and five other farmers showing whatever it may be, 3 or 3·30 per cent., we say, "Your milk is poor. What is the matter with it?" and then we show them the list. That is the average of the majority, and we expect the minority to keep up to that, and we insist upon it.

7239. The average is the amount taken over the whole, is it not?—I should take the highest.

7240. You call that the average?—Yes.

7241. (*Mr. Barham.*) You do not call the average the maximum, do you?—I should not put in the poor milk with the average at all.

7242. (*Chairman.*) That is hardly an average?—But I shall show you that there are only one or two farmers who come down, so that it would affect the average very little.

7243. But still that is rather a peculiar way of taking the average. The average would be taken on the whole I thought, and then divided up by the total number?—We do take the total, but I can show you figures that will prove to you that it is only one or two farmers out of a hundred or so whose milk comes in poor. When I started the test first some 13 months ago we found the milk was very poor indeed.

7244. (*Mr. Farmer.*) How do you test?—With the Gerber test. We have found it very reliable, and we have taken two or three samples, and sent it to a London analyst, and compared with our own test. It, as a rule, agrees with ours.

7245. (*Chairman.*) At all events the procedure you adopt now you find gives you good milk?—Yes.

7246. What is the result of the examination of this milk?—I can give you the actual figures. It is put down in a rough book at our factory.

7247 You will be able to summarise no doubt what the results are?—Yes. I can only say this, which is a very, very strong point, that the average of the milk delivered at Motcombe factory during March of this year shows 3·62 of butter fat.

7248. Is that during 1899?—1900—this last March.

7249. That is the average of how many cows, do you suppose?—There are 44 farms, and at some of those the farmers keep 70, 80, or 100 cows, but most of them 30 or 40. You might take an average of 40 cows to each farm, I think.

7250. Is that morning and evening?—That is morning and evening, mixed together for the month—the samples were taken every morning and every night, daily, week days and Sundays, from the 1st March to the 31st; and it was tested on the 2nd, the 6th, the 9th, the 13th, the 16th, the 20th, the 23rd, and the 27th—practically twice a week.

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7251. Can you say from those figures what the variations were between the highest and the lowest?—Yes, I can say that in the average there was only one farm which came very low. You could not call it a farm, but only a man who had got two or three cows, and this supply showed 2·85. I refused to take his milk, because it was not satisfactory at 2·85. Then, leaving all the others, I give you the lowest.

7252. (*Mr. Barham.*) Is 2·85 the average for the month for that man?—Yes, the average for that man for the month. I did not consider the milk satisfactory, and I wrote to him and told him the milk would not suit me. It was poor, and below the average of other milk that we were getting in, and when he came over I came to the conclusion that it was owing to the bad feeding with vegetables, turnips, refuse, and all that kind of thing, which will not produce fat, and I said I will not take your milk—it will not suit me. Now, I will give you the first farmer I have got on the list here, that is a man with quite 100 cows, and his average was 3·63 at one farm and 3·61 at the other farm.

7253. (*Chairman.*) Were there any days on which he fell very much below that?—On the first test in the first week it is 3·70; the next is 3·65, the next 3·75, and then we get 3·35.

7254. That is his lowest?—That is his lowest.

7255. (*Mr. Farmer.*) These are mixed milks, are they?—They are all put into a bottle morning and night for two or three days, and we put in an antiseptic, to keep it, and then take the sample. We get five 3·65's all exactly the same.

7256. (*Chairman.*) Then that is milk of very uniform quality?—It may be. As to that 3·35 we are not very much influenced by one test when it comes below the point, as in some cases it does.

7257. Below what?—Below the other average for the month. It may be that the man has forgotten to stir up the milk, and he might have taken a sample from the bottom of the churn, which would make a difference. If the milk had all been standing in the churn for an hour, or an hour and a-half, the cream would rise to the top.

7258. (*Mr. Barham.*) Would that be the morning's or evening's milk?—Both mixed together, I think I have got one here which is very low. It is 3·08—just over 3.

7259. Would that be the average from one farm?—That is the man who keeps a few cows. One figure is 2·75. I have had a lot of bother with this man; he is a small farmer with seven or eight cows, and I did not think the milk was genuine.

7260. (*Mr. Barham.*) What does he think?—I do not know what he thought himself about his milk, but I can give you evidence about it. He was very much annoyed when I told him his milk had been skimmed. Here is what the London analyst said about it—this is a copy of the report on the sample—"fat 2·64, solids not fat 9.12, total solids 11·76. The analysis shows 25 per cent. less than the average proportion of cream." Now that would bear out our opinion about the milk. I do not think the man skimmed the milk really, but what he did was to allow the calves to skim the milk. He took out the first portion of the milk, and the calves sucked the cream, and there we have it. It was pure milk really from the cow. That is my opinion, but I could never satisfactorily get to the bottom of it. That is the opinion I formed—that he was feeding some calves—because as a rule that man's milk is very good during the summer time. Then I have got the figures 3·78, 3·72, 3·74, 3·94, and so on, and I have got some over 5. I have got one of 4·44, and it has been so right through. The average is 4·36 for January, 4·27 for February, and 4·44 for March, and that result is brought about because the man feeds his cows properly, and gives them some cake in the winter time, it is milk from all breeds of cows, mixed breeds of Shorthorns and Herefords, crossed, and all sorts of breeds.

7261. (*Chairman.*) You have given us the figures for one particular month, but are you prepared to give us the figures for the whole year?—I am, and I can give the figures for the corresponding March of 1899, when I started taking these tests, because farmers used to come and tell me that the land was poor, and it would not produce rich milk, and all that kind of thing. My practical experience of testing milk showed me this, and I am very much surprised at it, because I was always given to understand that poor land produced a low percentage of butter fat, but these tests proved the contrary. In some cases we get a higher percentage of fat from poor land than we do from rich land.

7262. Will you kindly give us the figures then?—In March, 1899, our average was 3·18, and that was only from about five or six tests for each dairy during the month. We did not do it regularly then, because we were trying the Babcock tester, and we did not get on very well with it.

7263. Were these tests made under the Gerber test?—The ones for March of this year were, but for March of last year they were not.

7264. I understand the ones for this year were made under the Gerber test?—Yes, I am not certain, but if my memory serves me right that is the cause of the irregular testing—using the Babcock tester.

7265. You did not approve of that, did you?—No, but I am not certain about that being the cause. Anyhow, the average for that month is only 3·18.

7266. (*Mr. Barham.*) That is morning and evening?—Morning and evening. Then we have here the same farmer sending in milk from two farms, and the average was 3·20 for March, 1899, and the same farmer's milk for March of this year shows 3·63 and 3.61, so that he has improved 40 points.

7267. (*Chairman.*) But that test was by a different process, was it?—Yes, possibly. But I shall be able to show as I go on that by testing with the Gerber tester we have got an improved quality of milk since the farmers know that the samples of milk are being taken in the morning and at night, and they cannot shuffle anything into the factory and get paid for it. I am not speaking of the majority; I am only speaking of some (they are not all black sheep); but if some persons can send in milk and water or milk deprived of cream and get paid for it, they will do it, and I don't blame them either—I blame the buyers. I have had a lot of bother with these supplies. In some cases the milk has been sampled at the farm at time of milking, and in two or three instances it was found to be quite a different article from what we had at the factory.

7268. How many days was it after you purchased it?—At once—directly.

7269. The next day?—Yes, straight off—the next morning. We left no chance for them to increase the quality of the milk by feeding or anything of that kind, and I found a vast difference, and I called the farmer's attention to it, and said why is it. The result is that we have had better milk from these farmers since. I did that at several farms where the milk was poor, and we have received, and have done so ever since, milk that is satisfactory right through.

7270. (*Mr. Farmer.*) In which months are the poor milks?—I was given to understand before I took these tests that there was a lot of difference in the quality of milk from month to month, but as I go on I do not think there is much difference if the cows are properly fed, as they ought to be. For April, 1899, the average is 3·29.

7271. Is that by the Gerber tester?—Yes, that would be Gerber.

7272. (*Mr. Barham.*) Two meals again. Yes, all the same. Then in May it is 3·40, and June the same. We get in July 3.51, in August 3·60, and in September 3.77. Of course, up to December it is a few points more of butter fat, and after that it goes back a little. In October it is 3·83—that is the average of the whole milk delivered to this one factory. In November we get 3·93 and in December 3·83. That is the average of the whole of the milk, bad and good.

7273. (*Mr. Murphy.*) That is the morning and evening milks mixed together?—Morning and evening milks mixed together. The total average from March to the 31st December for the whole of the milk is 3·62. We had no average from March to the 31st December less than 3·42.

7274. (*Mr. Farmer.*) What was your lowest in May?—3·42, and that is from the man who feeds for quantity and not for quality, and he knows the way to do it.

7275. (*Chairman.*) But 3·42 is good quality, is it not?—No, I do not consider it so.

7276. It is a lot below your average of 3·60?—It is below the average, and I told him your milk is so many points below the average, and I showed him the figures.

7277. (*Mr. Barham.*) But you did not tell him how you arrived at the average?—In taking the average I have taken this total here, the good and bad together. As I

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pointed out to you, I have only got two that are bad, and those I have explained to you are only a dairyman and a small farmer.

7278. (*Chairman.*) There has been a little misapprehension about your average. You have taken the whole, the good and bad, and if you are short of that average you are not up to what you ought to be?—Just so.

7279. (*Mr. Barham.*) What you have done is to eliminate two suspicious supplies?—No, these figures I have given to you include the two.

7280. (*Chairman.*) The average is the real genuine average?—The real genuine average, as it is put down at the time.

7281. (*Major Craigie.*) Is that an average of 100 farms?—Forty-four farms.

7282. Not the hundred?—I have two other factories, but this is the result of milk delivered at Old Motcombe factory. I will give the others presently.

7283. (*Chairman.*) Do the other factories show very different results?—Of anything good or better than this.

7284. Do you wish to produce them?—If you wish to have them.

7285. If they are pretty well identical I do not suppose the Committee will want them?—Very well. A member of the Committee asked me the lowest in May. I must tell you that in May, 1899, I had only been making this test about two or three months, and there were some farmers that I could not pull up to the mark as to the quality of milk. They died hard, so to speak. They did not care to alter because they had been doing it all these years. They had been sending in adulterated milk, there is no doubt about it. I went to one, and he said it was perfectly pure milk that he had been sending in. I said, "It cannot be pure milk. Why is it your milk is poorer than others?" I went about it, and got in the back door, as it were, and found out that these people had been in the habit of keeping back two or three gallons of milk from the morning's milk and taking it into the dairy, and skimming it, and doing the same with the evening's milk, and putting it into the morning's milk, and they owned up that they had been doing it ever since we had the milk. But now they have stopped it, and the milk is very satisfactory. We found out that of these forty-four dairies three or four had been doing this. That is why I think in fixing the standard you want to fix as high a standard as you possibly can; but in saying that I wish to point out, and point it out very strongly, that the question is, where are you going to take the sample? because you are all aware that in transit the cream rises to the top, and in handling these churns on the railway, and also that in lifting them from the vans in and out, the top gets spilt, and that is the cream. If we send the milk away from our factory containing 3·50 per cent. of butter fat, that same milk may be analysed in London, and it may not contain any more than 3 per cent. Now I will point out to your Committee a case in point. Here I have on the 4th of April this fact, that we sent a consignment of milk to a London dairy company, and they wrote to us that the milk only contained 2·75 of butter fat and 10·65 of total solids. Now we were in a position to state that on that particular day the average of the milk received at our factory was not less than 3·60, and I am prepared to swear and to bring forward proofs that the milk was sent away precisely the same as it was received, because I live on the premises, and see the milk in and out. Now, as to this milk which contained only 2·75, where was the difference. I wrote to this firm, and said your consignment of milk is giving about so much, and I will take three samples; one I will keep myself, one I will send to you, and another I will send to a London analyst, and seal the churn. The result was that the milk showed 3·50 per cent. of butter fat, and on arrival in the sealed churn the analyst in London reported that the milk contained 3·50 per cent. of butter fat, and our test with the Gerber tester at home showed 3·50 per cent. butter fat. There is the proof that some adulteration had taken place after it left our factory, and before it got into the hands of our customers.

7286. (*Mr. Barham.*) You say the average on the first day was 3·60, but it does not follow that the churn that you sent away was up to the average, does it?—Yes, I think so.

7287. Do you mix them together?—Yes, we do.

7288. All the milks you receive?—One after the other, as fast as they bring them in.

7289. What is the size of the vessel?—As fast as the milk is brought in we cool it.

7290. What vessel is it mixed in?—We have a large tin, and the farmer brings in his milk, 40 gallons, say, and that is tipped into the receiver.

7291. How much does the receiver hold?—Three hundred or 400 gallons probably. It flows from thence over one of the largest coolers, filling two churns at a time. There was no milk in on that day—on the 27th—with anything like that percentage, from anywhere.

7292. (*Chairman.*) May I ask this, as to the particular can that showed this great discrepancy—was that a sealed can?—No.

7293. But the moment you do seal your churns you are safe?—Yes, and this is a case in point.

7294. (*Mr. Farmer.*) Could you say as to your three samples, that there was anything wrong whatever?—Nothing wrong.

7295. They all agreed?—When the milk left our place I had three samples taken, and I sealed the churns. One I sent to the analyst, one I kept, and one went to the company, and they tested the milk in the sealed churn, and that was satisfactory, showing 3·50. How it came about I cannot say. I know for a fact that when milk is sent away the cream rises to the top, and that is very often spilt, and that will make a difference. The percentage I am giving you here of butter-fat is for the average quality of milk when it comes from the farms.

7296. But they did not complain of the milk measure in the churn, did they?—No. In filling the churn you are not particular to a pint. It might be a pint over or a pint under the gauge.

7297. (*Chairman.*) Would the loss of a pint make much difference in that large churn?—It would make a difference. A churn of milk would contain about a gallon of cream.

7298. (*Mr. Barham.*) Did the milk in question go direct to Waterloo or was it changed at one or two intermediate stations?—Yes, it went to Waterloo direct.

7299. (*Chairman.*) Is there any reason why you should not seal up all your churns and make them all equally safe?—It would cause a lot of extra labour to have the churns sealed when you have to send away milk from the factories at the rate of 300 churns a night. It would take a long time to seal them all, and the railway company, when they got to the station, would say, "How do we know there is twelve or seventeen gallons in here." They sometimes want to take off the cover to look in. We would find the railway regulations affect that point.

7300. You object to sealing churns on account of the extra labour it would involve?—Yes, just so. That is only an isolated case that I have referred to, but the point might come in when you sent a customer 3·50 per cent. of butter fat and he got 3 per cent. only or less.

7301. But still you would not advocate that the standard should be fixed so as to meet the possibilities of abstraction of cream, would you?—No, certainly not.

7302. What is your idea of a fair standard all over the country?—I think the fixing of a standard bristles with great difficulties, but I should certainly advocate as high a standard as you could possibly fix. I believe if you fix a low standard it would not work.

7303. What do you call a low standard?—3 per cent. Say, for the sake of argument, you do that, the farmer would argue, and argue very naturally too, "Why should I send milk into your factory showing 4 per cent. of butter fat when the Government only requires 3 per cent?" What does he do. He says: "I will soon alter all that. I will increase the quantity at the expense of the quality," and that is easily done by feeding. If a farmer were to go and buy, say, in the summer time, a lot of bran and soak that bran in water and give the cows plenty of soaked bran it would reduce the butter fat at once; for example, I have got a case in my mind now in which a farmer did that and I called his attention to the poorness of his milk. It was last August or September, in the dry weather. He said, "I am expecting this; I have been feeding the cows on soaked bran mixed with a large quantity of water, and that causes the butter fat to be reduced." But he has altered his feed; he gives them cotton cake and stopped the bran, and the butter fat has gone up again.

7304. Then what do you think would be the proper standard to prevent it being done?—I have given you the actual result of the milk delivered from one of our factories, and, as to the standard, I must leave it to your

Committee to say what you think the proper standard should be. I only form my opinion that if you say 3 per cent. of butter fat shall be the standard we shall not get very much 4 per cent. milk, and we get a good deal of 4 per cent. milk now.

7305. Then you can regulate your price accordingly?—It is very difficult to regulate the price.

7306. I pay on a graduated scale at my factory?—You might do so, perhaps yours is a factory buying milk for making butter.

7307. It is, and I pay on a graduated scale?—Yes, but we are surrounded by factories in our county, and within a few miles of me we have several which carry on solely the business of sending milk to London and to other large towns, and perhaps they would not be so particular about the quality of the milk as I should be. If I say to a farmer you must supply me with milk containing such and such a percentage of butter fat, and I will pay you according to the quantity of butter fat, the man will say, "I am not going to bother about your butter fat; I will sell it to so-and-so here, who does not know if I take a little butter fat off." That is the difficulty we should be in.

7308. But they can do that now?—They can do it no doubt, but they might go to my factory or to another factory, and as long as I give them the same price as they can get at the other factory they are very well satisfied. Perhaps it is more convenient that they should send to me. I insist on getting pure milk, and the other man perhaps would not take the trouble to test his milk, except only occasionally, and therefore he would not know what quality of milk he was getting. You might ask the proprietors of half-a-dozen factories in the West of England to give you the figures for the quality of their milk during the past 12 months, and they would tell you they did not know, and that so long as they sent their milk away, and had no complaints they would be satisfied. If they had a complaint from a customer that the milk was poor they would sample the milk, and put it right. The system I work on is to buy the milk per gallon, insisting upon the farmer keeping it up to what I term an average standard. That is if 20 farmers send in 3·50 per cent of butter fat, and we get a few coming down to 3·20 we immediately write and say your milk is coming in very poor, or so many points below the others, and we must ask you to see to it, and invariably it is improved.

7309. (*Major Craigie.*) Do you buy on contract for a period?—We buy all on contract; sell a part only by contract.

7310. For how long is the contract?—Twelve months as a general rule, I have the figures for the factory at Stalbridge—I have not got the monthly average. I have in June 3·60, 3·50, and 3·40. That is the total average of the testing for each time they tested the milk. In July, 3·40, 3·50, 3·60, 3·50, 3·40. In August, 3·50; in September, 3·70, in October, 3·70, 3·70, 3·80. I get three 3·80's, six 3·80's, and two 3·70's. In November, 3·70, 4·20, 4·10, 4·30, 4·10, 4, 3·80, 3·90, 3·80, 3·90. In December, 3·90, and three 3·80's. In January, two 3·70's, two 3·80's, 3·90, 4·1. In February, two 3·80's, and in March we get five 3·60's, and three 3·70's.

7311. (*Mr. Cowan.*) It comes out about similar to the others?—A little better if anything, and there are 33 farms on this sheet.

7312. (*Mr. Farmer.*) You, I suppose, give all the farmers one definite price?—No, we fix the price according to the figures shown in this table. When a man comes to me I look this table up, and I say, "Yes, your milk shows very good figures, and I will give you your price," or another man's milk might show less, and I give a less price.

7313. (*Chairman.*) Then you have a graduated scale?—It is not really fixed. If a man sent in poor milk we should not give him the very top price. Then we take into consideration the quantity of milk sent in in winter. If a man says he will send in during December and January half the quantity of milk delivered in May and June that makes a difference in the price, because then we can depend upon the winter supply, we take the quantity and quality into consideration in fixing the contract.

7314. (*Mr. Barham.*) Do not your contracts have the minimum quantity?—Our contracts do not. Our best farmers will agree to send half the quantity in January and December that they send in May and June, and then if the quality of the milk is of the highest average we pay the top price to them, and if not we take off a half-penny or so off one, and something off another, and so on. Of course these figures of butter-fat and quantity of milk in winter decide the price. But the difficulty is this in regard to that, that a man will go away and say, I will sell my milk to the man who does nothing else, but send his milk to a large town, and who is not so particular as you are about the quality of the milk.

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7315. (*Chairman.*) You have that difficulty now?—We have that difficulty now.

7316. So that it would not be made any worse by fixing a standard, say at 3, because that is the existing standard now according to that table?—No, I think you would make it worse than it is if you fixed the butter standard at 3 per cent. I should get no milk in over 3 per cent. then.

7317. Then you would pay accordingly a proportionately lower price?—Yes, but I should get no milk at all, because the man would send his milk away, and he would be in a postion to get the same price as he does now, and I should not be in the same position then. And not only that, but there are farmers watching the result of this Committee very closely, and they know what butter fat they send in, and if a man has sent in 3·75 per cent. of butter fat, and the Government fix a standard of 3, he will say I will make my contract with you to deliver milk according to the Government standard, and I could not compel him to do anything more.

7318. (*Mr. Barham.*) No more can you now unless you pay a higher price for it?—No, but I get the milk.

7319. But you cannot compel him to send any more than will pass the official standard?—No, but when it comes to a question of compelling him to send in milk over 2·75 or 2·80, or whatever is supposed to be the standard, it is another thing.

7320. (*Major Craigie.*) Is not there an inducement now if he sends in a better standard of milk?—He would not get the price.

7321. Would not the inducement be the same. You say I pay so much for Government standard milk, and so much for milk over the standard?—The difficulty with farmers is that they do not want to be surrounded with anything they do not understand, and they say, I do not understand anything about butter fat or cream, I will send you the milk as it comes from the cow, and you must give me so much a gallon for it. I know that, because we have had that point up. They say, how can I tell how much butter fat is in it.

7322. (*Mr. Farmer.*) I thought you said they were watching the Committee very closely?—It is to see if you alter the standard. At present we contract for pure milk, and should not consider 3 per cent. up to our standard of points.

7323. (*Mr. Barham.*) Do you suggest there should be no standard at all, and that we should allow things to remain as they are?—If you can improve matters do so.

7324. (*Chairman.*) Do you think we should do it?—I do not see how you are going to improve matters by fixing the standard. You will get more poor milk than you do now for certain. If you say that the standard shall be 3 per cent. or 3·20 per cent. of butter fat, then I think any farmer, or any man, would be very foolish to sell milk containing 4 per cent. of butter fat.

7325. (*Major Craigie.*) Not if he were paid more for it?—The question of being paid more for it is another thing. Take this example. If I have to send a lot of milk away to London, and 3 per cent. is fixed for butter fat should not I be perfectly justified in reducing the quality of the milk to 3 per cent.

7326. (*Mr. Farmer.*) You would be acting illegally?—But should not I be acting within the letter of the law?

7327. No, because you must sell genuine milk?—But if we sent milk of 3 per cent. of butter fat.

7328. But you do not do it?—Yes.

7329. But it must be genuine under any circumstances whether it is 4 per cent. or 5 per cent.?—But how do you know it is genuine, or not if it contains 3 per cent of butter fat.

7330. (*Chairman.*) We have not got to define genuine milk?—No; but if you say genuine milk shall be formed of certain constituents, that it shall be 3 per cent. of butter fat, that is one thing.

7331. But if it is less than that it raises the presumption that it is not genuine?—I quite agree with you.

7332. We do not say that is the standard of genuine milk. We only say if the milk falls below our standard it will raise a presumption at once that it is not genuine?—Then it would be taken that any milk showing 3 per cent.

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of butter fat would pass the Inspector, and nothing would be said about it.

7333. 3 per cent. is the present standard?—I am under the impression that it is 2·75.

7334. That is the standard as far as any standard does exist. It is that at present, and therefore I do not see if it is fixed definitely more than it is now how it would alter the conduct of the trade in milk in the country, but you are afraid it would?—I am afraid it would.

7335. (*Major Craigie.*) If the standard were fixed at 3 or 3·25 would you object?—If you have a fixed standard it should be put as high as you can within reasonable limits.

7336. (*Mr. Cowan.*) How high?—I tell you what the milk actually has shown.

7337. (*Mr. Farmer.*) You cannot give us the morning's milk as distinguished from the evening's, can you?—No, the morning's milk would be 35 or 40 points less than the evening's.

7338. Less than the evening's, or less than the average?—Less than the evening's. For instance, you get milk from a farm in the morning showing 3·20, and 3·60 or 3·70 at night from the same cows, and the average I am giving you is the two put together.

7339. (*Major Craigie.*) Exactly, and therefore putting it at 3·20 it would be a standard which you would not object to—not so strongly, at all events?—So far as we are concerned in the country I should not object to a 3·20 standard, but when you come to the milk being in transit and rolled about, and the cream wasted, which it is daily, I am afraid you would not get 3·20. That is the difficulty to my mind.

7340. (*Chairman.*) The 3 per cent. would be more likely to be safer to cover all risks?—Any milk showing less than that 3 per cent. I should look upon with very great suspicion.

7341. (*Mr. Barham.*) But according to your own figures in March, 1899, for instance, the average for the whole of March of the two meals mixed together is 3·20?—That is the test for the month, but it is not reliable at all, because it is done irregularly.

7342. (*Mr. Cowan.*) Was it done by the Babcock tester?—I could not say. I had a Babcock tester in use, but when I had it in use I should not like to say.

7343. You gave us 3·20, I think?—3·18. That is a very low average.

7344. (*Mr. Barham.*) If you take off the two, which you must do, you get morning's milk with 3 per cent. of butter fat?—Yes.

7345. In the following month, and treating it exactly in the same way, you get morning's milk with 3·09?—That is so.

7346. Would you be prepared to send that milk to London and accept the responsibility of it, and have it judged by a 3·2 standard?—No, I should not care to do that.

7347. Would you care to have it judged by a 3 per cent. standard?—The difficulty comes to my mind in this way, that there is a waste of the material substance, the cream, and that takes place after it leaves the farm or the country, and before it gets delivered in London.

7348. In this case you give us the average of the morning's milk?—Yes.

7349. Then, in many cases, you must be below the average, so that your average, according to your own showing, of morning's milk in two or three months out of the nine or ten you have given us, would be below 3 per cent. of butter fat?—Yes. I have also shown you that since I have tested the milk the milk has improved in quality.

7350. (*Chairman.*) You have to deliver milk in London yourself, have you not, to various places?—Yes.

7351. Do they stipulate for anything?—For pure milk, and we give a guarantee of pure milk.

7352. But not any percentage of butter fat?—No. It is only guaranteed pure milk. For April, 1899, I gave you 3·29. Now, for April, 1900, the average was 3·52.

7353. (*Mr. Barham.*) Do not you think that may have been brought about by climatic conditions or other conditions, perhaps?—It is principally feeding, I think. We have had a dry April. Of course, when we get very wet weather we get poorer milk as a rule, and these averages I am giving you are for a very dry summer.

7354. And, therefore, they are rich in butter fat?—They are rich in butter fat. The figures I have given out are the actual results of the milk supplied to our factories, and not with any intention to produce them publicly, or anything of that kind.

7355. Do you not wish it to be published, because it is all on the notes, and it will be public property before long?—It is immaterial to me whether it is published or not. They are the actual facts.

7356. (*Major Craigie.*) You have put a note on your *précis* as to the amount of cream, and have you any evidence to give the Committee on the subject of separating milk for getting cream, or how would you define cream?—We define cream according to the number of pounds of butter—the butter yield.

7357. Do you sell cream as cream?—Yes, but if I were to sell cream, or were asked to sell cream with a guaranteed amount of butter fat, I should say we will guarantee you cream to produce 50, 55, or 60 per cent. of butter fat.

7358. Would you suggest a standard for cream?—I have not the analysis, but I can give you the figures that it produces: 6lbs. to the gallon is the yield of butter—that is, 60 per cent. of butter fat; and in churning a large quantity of cream our experience is that a gallon produces 5½lbs. of butter on an average.

7359. (*Mr. Barham.*) Is that cream which you separate yourself?—Yes, and which we send away to our customers.

7360. But would you separate your cream as thick as that for butter, from an economical point of view?—That is our general average; 5½lbs. is what we churn ourselves, and we should consider cream that contained less than 50 per cent. of butter fat very poor.

7361. (*Chairman.*) You think cream that contained 50 per cent. of butter fat ought to be recognised as genuine cream?—Yes.

7362. (*Mr. Farmer.*) How do you estimate butter fat—it is not by analysis?—By the amount of butter it produces I estimate it.

7363. And you say 6lbs. to the gallon?—We are sending cream away to customers now returning 6lbs. of butter.

7364. Of course, you know it contains a great deal that is not butter fat?—That is so.

7365. So that it would not be all butter fat?—I am speaking of the amount of butter fat that is produced from the cream.

7366. (*Major Craigie.*) Perhaps it would be a standard of 25 or 30?—If we send cream to an analyst in London he returns it the same as we say—50, 55, or 60 per cent.

7367. 60 you said?—Yes, that is 6lbs. to the gallon.

7368. (*Mr. Cowan.*) Or even up to 70?—Yes. It is done every day, and has been for years. I could give the name of the company that is buying our cream. We have got a contract with them to supply cream to make about 1,200lbs. of butter a week, and we send the cream and they advise us of the butter yields.

7369. (*Mr. Farmer.*) Yes, but that is not at all the percentage of butter fat?—We have sent samples of cream and had it analysed, and it generally comes back about the same as we get from the yield. For instance, if we are having a yield of 5lbs. of butter to the gallon and we send it to the analyst he returns 50 per cent.

7370. (*Chairman.*) Have you got the figures here?—I have not.

7371. (*Mr. Cowan.*) I think we have had it before us that cream can be analysed to show up to 70 per cent. of butter fat?—Just so.

7372. (*Major Craigie.*) Have you some of the returns of this cream for London or elsewhere to put in?—I have not any of them here with me.

7373. (*Chairman.*) But, as far as your memory serves, the average return of your cream shows 50 to 60 per cent.?—Yes. I can send analysts' reports.

7374. (*Mr. Farmer.*) But my point is, that 6lbs. of butter to the gallon does not mean that proportion of butter fat?—Oh, yes.

7375. You are allowed to have 20 per cent. of water in your butter, or 15 per cent., are not you?—That is what you get besides, but you have the fat. If we offer cream at 7s. or 8s. per gallon, and that cream contains 55 per cent. of butter fat (which we are prepared to say it would contain), and another man comes forward and offers it with 40 per cent. of butter fat at 1s. a gallon less I have no chance with him, and there should be a standard fixed for cream.

7376. (*Major Craigie.*) Cream is sold at different prices?—That is so.

7377. According to its quality?—No; I understand only one quality of cream, so far as I know about cream.

7378. It has been suggested to this Committee that there ought to be two or even three grades of cream, and that, as a matter of practice in some parts of the country, notably in Scotland, cream is sold at varying prices, according to the proportion of butter fat in the cream?—I think it would be very harassing to the trade if that were so.

7379. But it is not your experience that it is sold in that way?—No, it is not so in my experience.

7380. (*Mr. Barham.*) But you have, in London, always thick and thin cream at different prices?—Yes, that is so. But you sometimes have the addition of milk, and milk is cheaper than cream, and that is why I am very strongly of opinion that a standard should be fixed for cream.

7381. Do you sell the separated milk separately?—Yes.

7382. After selling the cream?—Yes.

7383. Is any question raised of any standard for that at all?—No, I do not see how you can fix any standard for that unless it is a standard with no water in it.

7384. (*Mr. Cowan.*) A standard for solids?—The solids would be the same after deducting the butter fat.

7385. (*Major Craigie.*) Have you had your attention drawn to the difference between hand-skimmed milk and separated milk?—Yes.

7386. On that point have you anything to say to the Committee?—There is more butter fat left in the hand-skimmed milk than in the machine-skimmed milk.

7387. How much—could you give any idea of the proportion or difference?—No, I could not give you an exact percentage, but I know this, that we make a lot of Devonshire cream at our factory, and, after we have skimmed off the cream, we put the skim milk through the separator again and got out the cream that has not risen naturally.

7388. Have you ever had any experience of imported cream from Sweden or any other country being brought down and mixed with the local cream?—I have heard of milk being imported into Southampton from France and other places and being used, and I have had two churns of French milk from Southampton and a churn of cream to test to see what it was like, and found the cream that I had, speaking only from memory now, contained not more than 28 or 30 per cent. of butter fat—not cream—that is to say, the gallon only produced about 3lbs. or less of butter.

7389. How did that come—in what sort of receptacle or vessel?—In a churn. We asked a customer in Southampton, who was interested in the matter, as it was creating competition with our supply, and this gentleman said he would buy us a churn of cream and a couple of churns of milk and send them down, and it was tested by us, and I also put the milk through the separators and found the result was very bad. I am speaking only from memory without the actual figures, but I can produce the actual figures, if necessary. They were sent to Mr. Long at the Board of Agriculture at the time, and he sent them to the Local Government Board, and I believe the result was something like 2·50 or 2·60, or something like that, of butter-fat. I said to Mr. Long, "Why should you allow this milk to come in here showing only 2·30 or 2·50 or 2·60 of butter-fat, whereas if we sent it to London and it was sampled we should be prosecuted if it showed only that?"

7390. Have you any reason to believe the foreign milk sold in London would not be equally open to prosecution with home milk?—The reply I had officially was this, that they had no power to interfere with it. I asked them to take a sample at Southampton, and they said they had no power to do it.

7391. When milk is sold, even if of foreign origin, is not it exactly under the same law as milk from Dorsetshire?—It may be if you can find it, but you cannot find it.

7392. You mean it is sold surreptitiously?—You would find a difficulty in getting an inspector to distinguish them.

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7393. But you do not suggest there is any different law as regards the treatment of milk of foreign origin from that of native origin?—I suggest if an inspector went to Waterloo Station and took a sample of milk from Dorset and found it contained only 2 per cent. of butter-fat we should be prosecuted.

7394. And the same would be the result if it came from France, would it not?—I have never seen a case in which it has been sampled.

7395. But you do not suggest there is any legal difficulty in the one case more than in the other?—The only thing I know is that the authorities advised me that they had not the power to take samples of French milk.

7396. In France?—In transit.

7397. (*Mr. Barham.*) You mean the answer you had from Mr. Long was that the Board of Agriculture had not the power to take it?—That is so. They sent it to the Local Government Board, and they said the same.

7398. (*Major Craigie.*) You are probably referring to the fact that neither the Board of Agriculture nor the Local Government Board prior to the Act of last year had the power in the matter that the Customs authorities now have. But I put it to you that the Inspectors of the Local Authorities prior to the 1st of January, 1900, had just as much power over that French milk as over the English milk—neither more nor less?—Then why did not they exercise their power?

7399. But I only put it to you that there is no difference in the law as regards milk once it is landed in this country?—There is no difference in the law, I grant you, but I have a very strong opinion that there is a certain amount of hesitation on the part of someone.

7400. Of whom?—It may be on the part of those in authority, or they may not like touching the imports at all.

7401. Do you suggest that a local authority would be less willing to sample milk found in a London station if they thought it came from a foreign source?—I only know it is not done.

7402. You do not suggest it?—I only know the thing is not done, and I could give you other cases which are outside this inquiry, but I am afraid I should be out of order in doing so.

7403. You suggest that milk is coming to this country of a lower standard than the British milk, do you?—I only give you the experience of my tests of two churns of French milk, and the excuse was given that the milk was drawn from the bottom of the drum, but I believe they draw out so much milk, when the cream would naturally go to the bottom, and then that would come out as cream and be sold as cream. That is the information that I had as to the excuse for the milk being poor.

7404. Then is it not rather an argument in favour of fixing a legal standard to which all this foreign milk and cheap milk that you speak of should conform. Is not that rather in favour of fixing a standard such as this Committee has now before it?—Yes, undoubtedly it is; but why should not a sample of that milk be taken on landing at Southampton and the other ports.

7405. Under the Act of last year, I presume there is no reason why that should not be the case. You are aware of the change of the law in that respect, I suppose?—Yes, but we never see any prosecutions. If we see any prosecutions whatever, it is simply a prosecution against English milk, English cream, or English butter. We see no prosecutions against foreign stuff whatever.

7406. But have you formed an impression of the relative amount of English milk consumed in this country and the minute amounts of this foreign milk, which makes it about 7,000 cwts. altogether? Are you taking into account the proportion of the two bulks of milk?—I am in reference to the milk, because I know the quantity of French milk that is coming in here is not worth thinking about.

7407. It is too small?—It is too small in quantity, but I have in my mind where the balance is reversed, and we have the same thing.

7408. In which case?—Perhaps I should be out of order in mentioning the case here.

7409. Do you mean not milk?—Not milk.

7410. We have nothing to do with anything except with milk?—No, but as I say, I could mention a matter in which the balance is reversed.

7411. Quite so, but I am only anxious to get from you

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that there is an impression in your mind that there is a different practice—I will not say a different law—in the action of the local authorities *qua* that small quantity of French milk from that which is pursued in the case of ordinary British milk. That is your impression?—My impression is this, that the authorities when the milk did come in much larger quantities than it does now, did not take samples of the French milk.

7412. But it never did come in in any very large quantity?—No, but we have never seen any prosecution against the French milk.

7413. And you suggest that if there is a possibility of a standard being fixed it might be found to apply more stringently to that poor milk than the other?—It would if it was of the same quality of milk that I tested.

7414. That is your suggestion?—I have been told the French milk is very rich, but my experience is it is quite the contrary. That is the only experience I have had of it. I have never used French milk in any shape or form either for separating for cream or mixing with English milk, but still, I believe it is done by a few when English milk is short.

7415. Now, as to the insufficiency of the Babcock machinery for testing milk. Have you had the inaccuracy of the bottles or measures used brought to your notice—either the inaccuracy of stamping or marking on the bottles?—No. I tried a Babcock tester, and found it did not answer our purpose, we had to put in some water and swill the bottles, the testing took longer, and was somewhat tedious.

7416. It was not on account of the inaccuracy of the marking?—No.

7417. We have had that point brought under our notice?—My experience does not go so far as that.

7418. Then you do not see any advantage in the suggestion made to the Committee that possibly if these false measures were marked it would be an advantage to those who used that kind of measure?—No, I do not think so.

7419. You do not think it is worth while?—My experience is that if the butter-fat is there you can find it, and you cannot if it is not there.

7420. You have no detailed evidence as to condensed milk, have you?—No, not as to condensed milk.

7421. (*Mr. Cowan.*) You were speaking about the difference in the test of milk that you sent from one of your factories to a customer of nearly 50 per cent.?—Yes.

7422. Then you seemed to suggest that milk deteriorates in transit. Is that the case?—No, I suggest the cream is spilt in transit. The cream rises to the top of the railway can, or the milk carriers in rolling these churns on the platform will tip them over, and so some will come out of the top, and that is all cream. That is a risk you have.

7423. That is through carelessness in handling, of course?—I do not think so. You must bear in mind that thousands of churns of milk have to be handled in a short space of time, and that has to be done very quickly.

7424. It is through the ventilators being taken off the can, is it not?—Yes, but I do not think you could convey milk without ventilation.

7425. I send it 200 or 300 miles every day in that way?—What quantity, may I ask, do you send?

7426. 100 to 150 gallons a day—that is refrigerated?—Just so, and if we had only 100 to 150 gallons a day to send we should take a lot more care with that than with 5,000 or 6,000 a day.

7427. I do not see that follows, because you have more men to work it. I do not see why you should lose the percentage you speak of in the course of transit through a little want of care?—It is done every day—the cream is lost in transit. I do not say it is through carelessness, but through the necessity of the case and from the way they have of handling the churns.

7428. I rather thought you meant it deteriorated in the course of transit?—No. You must take it out—it must be either spilt or taken out.

7429. Could it not be adulterated in transit?—It is possible, but I do not see how. I do not see that the milk can be adulterated in actual transit by rail. If at all it is done either at the sending or receiving station. There is no means for anyone to get into the vans in transit.

7430. But I consider it is in transit from the time it leaves you to the time it gets to its destination?—If you consider it is in transit from the time it is at the railway station to the time it is taken away, no doubt adulteration does take place.

7431. That might account for the difference you speak of?—Yes.

7432. How does the Inspector take the samples?—I have no experience of that, but from what I have been told he goes to the man that is retailing the milk and says: "I want a pint of milk," and the man draws it out.

7433. I rather think he takes it out himself from the churn?—I daresay, but does he stir the milk? I do not suppose one man in a hundred stirs the milk.

7434. He is bound to do it—he could not take the milk at random?—If the man had been taking the milk from the top he would have been taking off all the cream.

7435. But the Inspector would not do that?—The cream would be gone before the Inspector came.

7436. Do your supplies come mostly from the country?—Yes.

7437. From what part of the country?—Dorsetshire.

7438. Long distances?—Yes.

7439. How long do you hold the producer responsible for the milk to you?—Till he delivers it on the platform of our factories.

7440. You have not quite given us your idea, I think, of what the standard for cream should be, although you insist there should be a standard?—50 per cent. of butter-fat—not less than that, surely. If you make two standards, one for thick cream and one for thin cream, that is two standards, but I only recognise one standard.

7441. We have had it suggested that we should put it as low as 15—that was in Glasgow. Would not you suggest a minimum that it could be sold as cream at?—I am only speaking now of the butter-fat and the cream that we deliver commercially to the trade, and if I sent cream with less than 50 per cent. of butter-fat my customers would complain. In fact, they have 55 per cent., and if they got below 55 per cent. we should get a letter back to say "Your cream is thin."

7442. Is that for the making of butter?—It is for selling as cream.

7443. You would not consider cream with 30 per cent. of butter-fat to be good enough, would you—it should not be sold as cream?—Are you speaking of the retail trade now?

7444. Yes, and that is a very large trade?—Yes, but I am speaking of the wholesale trade because I have got no experience of the retail trade.

7445. But if you have so much experience in connection with cream, you must know something about that?—My experience is this, that cream properly separated from the milk and sent away directly it comes from the separator will produce not less than 50 per cent. of butter-fat, and in our practice from the 1st of January to the 31st of December right through, it would not be less than 55. That is the actual state of affairs, but what standard you should fix for the retailer to sell the cream at I leave to you.

7446. You cannot suggest a standard for that?—No, I cannot.

7447. But that is a very large and important business?—Yes, I know it is.

7448. However, your suggestion reaches up to 50 per cent.?—I tell you that is the actual butter-fat in the cream we send out.

7449. Then you would not suggest a lower standard?—No, I should not suggest anything lower.

7450. (*Mr. Barham.*) While on the subject of cream, do you suggest it is to be considered pure supposing it has an actual preservative with it or not?—Yes, I should.

7451. You recommend that in the event of this Committee fixing a standard, or recommending a standard, for cream, we should not exclude the use of preservative?—Certainly not.

7452. That is supposing it is not detrimental to it?—Unless you want to cripple the whole agricultural industry of the country, the same as they are doing already. I could produce letters and letters from customers now, telling me that they cannot sell the cream because they were afraid they would be prosecuted for doing it.

7453. That is to say, it is your practice to use a small quantity of preservative?—Ever since we have been in

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the dairy trade we have used it, and we cannot carry on our business without it—it is utterly impossible. The customers say your cream does not sell, and others say we do not care whether you pasteurise it or not, but we must have cream that will keep a week, and the public will not buy sour cream. The result is that we should have to make it into butter at a loss, because it is more profitable to sell it as cream than as butter. We have tried to do without preservative, but the customers cannot get on without it.

7454. (*Mr. Farmer.*) That applies to all jar cream, does it not?—Yes.

7455. In fact, all cream that has to travel?—Yes, and that is a point I had in my mind when I was on the question of prosecutions in regard to milk.

7456. (*Mr. Barham.*) Is the cream you sell jar cream?—We send cream away in churns. For instance, I have got a contract now to supply one customer in London with 36 gallons of cream a day for six months, and we are sending jugs of cream to grocers all over the country. We are sending cream to Edinburgh and to the Chairman's factory, and we send cream to that gentleman that gave evidence before me, Mr. Smith, at the Ipswich Dairy Institute, for their Dairy Butter Schools and butter making, but they do not require preservative in cream for butter-making. We are also sending upwards of 1,500 jugs to one wholesale man in London every day throughout the year. Jug cream is now largely sold by grocers.

7457. You are of opinion that the great bulk of that trade will be lost without the use of preservatives?—It is bound to be.

7458. And your business will not be so profitable if that trade is lost?—I should have to shut up.

7459. You will have to make the cream into butter that you now sell as cream?—Yes.

7460. And to protect yourself you will have to reduce the price of milk to the farmer?—Yes, and that will be a reduction of quite 20 per cent. in the value of the milk if we have to buy the milk to make into butter and compete with the importations from abroad, and that is what I had in my mind just now when I mentioned about the prosecutions against foreign goods. I had in my mind the question of cream or butter for which no end of prosecutions have taken place every week for using preservatives in English cream and butter. You never see a prosecution against foreign goods for using preservatives, but they come over steeped with it every day.

7461. You are aware there is a Committee sitting, before which you might give that evidence, are you not?—Yes, I know that.

7462. (*Chairman.*) But that is rather out of our power here?—Yes. I mentioned just now that I should be out of order, but Mr. Barham has referred to it, and it is most important. It was not the French milk I was driving at, but the cream and butter.

7463. (*Mr. Farmer.*) Are there many of these butter and cream factories and milk factories in Dorset?—Yes, a large number.

7464. As large as yourselves?—There are larger milk factories pure and simple, that is, for receiving milk to send away, but they do not go in for separating as much as we do. We are the largest in the West of England for that.

7465. You do 5,000 to 6,000 gallons a day?—Yes; and it is increasing. We separate more than half of it.

7466. Is that separated milk sent to the towns, or is it consumed in the country, or partly one and partly the other?—It is sent away.

7467. All sent away, summer and winter?—We sell it all if we can—we do not give it to the pigs unless we are obliged to.

7468. Is there more sent away in winter than in summer?—Yes.

7469. And principally to the towns?—Yes.

7470. That applies, I suppose, to all these factories?—No, some of the factories separate scarcely anything, they do all new milk, and send it away.

7471. According to your showing to-day, if you separate a good deal more than half of it, you separate about a million gallons of milk a year?—Yes. We have got one margarine factory which takes four or five thousand gallons a week of separated milk, and then we send a lot of separated milk to biscuit factories, and other people buy it. It is sold as separated milk, and unless we had a demand for separated milk we could not sell our cream and butter at the price we do, because we look upon our separated milk as a valuable asset. We could not carry on our business without selling it at a fair price.

7472. (*Mr. Shirley Murphy.*) When you were expressing the opinion that the fixing of a standard would tend to lower the quality of milk, did you mean such milk as is supplied to factories or such milk as is now supplied to the public, taking into account particularly the people who purchase small quantities for necessary purposes?—I think it would equally apply to both ends. I do not think myself that the retailer would give the consumer more than he was obliged to give him according to the Government standard, that is, if you fix a standard, and I do not think the farmers would be inclined to feed their cows in order to produce 3·60 or 3·75 per cent. of butter-fat in their milk when they need not produce more than 3 per cent.

7473. They might have to produce more than 3 for your purposes in your factory perhaps?—Yes, that may be, but as the thing stands now, there is no standard, I take it, really.

7474. Is it not thoroughly understood amongst milk producers that there is a standard?—No, I do not think so. Since there has been publicity given to this Committee sitting upon standards, they are all alive to the fact to see what the result would be, and I certainly am very strongly of opinion that if you fix a standard at all, it should be fixed as high as you possibly can do it, taking into consideration all these disadvantages and risks of the cream being spilt in transit, and of the Inspectors taking the samples either from the bottom of the can, or dipping it out of the top, as perhaps some customers may have had the cream before the Inspector takes his sample, and it is not there, or not there in proper quantity.

7475. But you would not suggest that the standard should be fixed in view of the carelessness of people who have charge of the milk in conveyance. Surely the proper thing is to adopt some proper method of carrying the milk so as to prevent accidents of this sort. Is there any reason why the consumer should suffer for that?—I think that the competition of trade and the amount of capital and brains that there is in the milk and dairy trade, will, and do, find out the best vessels that are adapted for the carrying of milk and cream from the country to the towns for their own interest, without being compelled to do it.

7476. Quite so, then a standard might be fixed independently of considerations of that sort?—I am not against a standard—not at all.

7477. I took it you were from what you said?—No. I am not against a standard if you understand me. If you fix the standard I should like it as high as possible, but I do not think you are going to improve matters by fixing the standard—not better than we have got them now. I do not see how you can.

7478. It would tend to equalise the quality?—It would tend to average the quality of milk, that is, to bring down the best milk to the medium and to pull up the poor milk to the medium, but you will reduce more than you will raise, because I have given you in my actual figures the fact that there are only two dairies in this book which you will raise up to 3 per cent., whereas you might bring 42 down from 3·50 or 4 to 3 per cent. That is where I am afraid the danger will come in.

7479. (*Chairman.*) You heard the last witness, did you not, and what he said about the quality of milk in his district?—Yes, I did.

7480. If we fix a high standard according to your wish, what must happen to that poor milk?—They must feed their cows better. They have the same cows as we have in the west, Herefords and Shorthorns, and so on, I gather, and I see no reason why they should not produce as good milk as we do in the west.

7481. But you heard him explain his difficulty?—Yes, but I did not agree with him. If they feed their cows in the eastern counties on brewers' grains, turnips, mangolds and watery stuff they must expect poor milk, but if we feed them in the west of England on cotton cake and good food, and therefore produce better milk, I say we are entitled to a better price for it.

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7482. (*Chairman.*) You come before us as representing the British Dairy Farmers' Association?—Yes.

7483. Do you also put forward your own personal views?—Yes; my own personal and what views I can obtain from different people, but I think you have already had before you one or two members who have given you their views.

7484. But do you wish to present this evidence to us to-day as your own personal views or the embodiment of the views of a large number of people?—No, it would be impossible to present it, I think, as the embodiment of the collective body, because their opinions differ. I must present it as my own personal views, but I take it that a very large majority of the members would agree with what I say.

7485. Will you tell us, then, what your own experience upon the subject before us is? You are not farming at present, are you?—No, I am not farming at present, but when farming I kept my cows fairly well tested. I used to test them at least once a week, and their milk was weighed, and I used to take an average sample of the milk morning and evening, and test two or three cows individually at the same time, so that I was led to take an interest in the subject because I tested these cows morning and evening for very nearly a year, and my cows were not what you might call a fair sample of dairyman's cows, because they were kept entirely for the production of butter. One-third of them would be cows that I should keep if milk had been my only object, and two-thirds would be Jerseys and half-breds, and not dairyman's cattle. I have looked up my own analyses, and I was struck with the fact that if a standard was fixed there would be times, particularly in the morning's milk, when it would be quite impossible for any man keeping ordinary dairy cattle to keep up to, and when he would fall below even a moderate standard. I found that twice in the year my morning's milk had come down to 3·18 and 3·28. Now, if you consider that only one-third of my cows were cows that are ordinarily used for producing milk and that two-thirds were half-breds and Jerseys, I do not know where I should have been if the whole of them had been ordinary cattle. Certainly, with what you may call the ordinary dairy type of cattle, that is, the ordinary cross-bred Shorthorn breed, when my milk fell to that it would certainly have fallen once or twice in the year considerably below the standard of 3 per cent. of fat. So that, feeling sure that the morning's milk of ordinary cattle that are kept in dairies must fall sometimes below 3, I got some analyses done from dairies that I knew round my own district to show their morning's and evening's milk. I asked them to have samples taken of the morning's and evening's milk, and send them up to a public analyst, and I have here evidence from about 600 cows, representing eight dairies. Two are from the same one. I think the chief point that I wanted to draw attention to, first of all, in my evidence, was that the great discrepancy between the morning's milk and the evening's milk is accentuated by uneven times between the milkings. If you milk at twelve and twelve hours that is an even time, and if you milk at eight and sixteen hours that is a most uneven time, but eight and sixteen hours is very common in milking. Round the suburbs of large towns a great deal of milk that is supplied to the suburbs is milked, and necessarily milked, at that time, because the dairymen must begin milking at four o'clock in order to send their carts on the round, and at twelve o'clock, as the people will have it in the afternoon. So that leaves only eight and sixteen hours. Here is a dairy of sixty cows, which are extremely highly fed on very concentrated food. The morning's milk showed 3·45 of fat and the evening's milk showed 4·97. The total solids were 12·40 in the morning as against 14 in the evening.

7486. Is that on one day?—The same day—one consecutive twenty-four hours. Then the only man whom I could find, a friend of mine, who milks at what you might call reasonable hours—that is, twelve and twelve—is the only man whose fats approximate at all. He milks about sixty cows, and that is at about twelve and twelve, and he arranges to keep his afternoon's milk over into the morning. He begins about half-past three. I put his case forward because it is the only one approximating. His morning's milk showed 3·30 and the evening's milk showed 3·62. That is only a difference of ·32. The total solids were 12·50 and 12·58. That is the only man I can find within a certain radius of my own house who milks at even times. I know all these men personally. Then the next man milks 130 cows, at nine hours and fifteen hours. His morning's milk showed 3·15 and his evening's milk showed 3·91. Then, coming to his total solids, the morning's milk showed 12 and the evening's showed 12·80. Then another man milked fifty cows, at nine and a half and fourteen and a half hours interval; the morning's milk showed 3·53 and the evening's milk showed 4·29. The total solids were in the morning 12·50 as against 13·16 in the evening; and then the next man milks 175 cows. I might say, in explanation, that this man's cows are not bred from, they are all bought-in cows, and when a cow gets down to seven or eight quarts she goes out to the butcher. If you walked through this man's sheds you can easily see when an animal has been in his shed two or three months—they put on flesh and go on. They are largely grained, as well as fed on mangels and a quantity of meal. His samples taken showed 2·87 of fat in the morning's and the evening's milk showed 4·30. The total solids were, for the morning, 11·50 as against 13 in the evening. My friend was naturally extremely annoyed when I showed him what his milk was, and he had another sample taken, I think, within four days, but I will not be quite certain to a day, because I met him after he had written me a letter on the result of the first test—it might have been five days. That sample showed for the morning's milk 3·20 as against 4·33 in the evening for the evening. The total solids were 12·18 in the morning as against 13 in the evening—very nearly the same as on the first day. There was a difference in the morning. He seemed quite satisfied on that, and I said your defence would not have been quite satisfactory if you had had to refer to the cows on the four or five days afterwards. The next case is a somewhat similar one. This is a miller's case, and his cows are fed pretty much the same as the last ones, but they have rather more offal, I think. His morning's milk showed 2·92 of fat and the evening's milk showed 4·79; that is again a case of eight hours and sixteen hours. The total solids were, in the morning, 11·74 as as against 13·86 in the evening.

7487. How many cows are there in this case?—Sixty, and the cattle were in excellent order. The total solids in the morning's milk were 11·74 and in the evening's milk 13·86. Then the next one is to me more interesting, because these are cows that are bred from, and they are very highly fed—at least, they have about 8lbs. or 9lbs. of as good concentrated food as you could mix; it consists of decorticated cotton cake, bean meal, and linseed cake; you could not improve the mixture, and they are also milked at eight and sixteen hours. The percentage of fat in the morning's milk is 3·44, the percentage of other solids is 9, giving a total percentage of solids for the morning's milking of 12·44. The percentage of fat in the evening's milk is 4·52, of other solids 9·10, giving a total of solids at 13·62. I asked this gentleman to have it done, because he showed me some figures which he had worked out for himself in February, 1898, when the cows were on just the same feed as they are having now. These figures were taken in February by himself, because he had had some complaint from his retailers as to the deliveries of his milk. He then tested his cows from February 2nd to February 22nd with a Gerber tester—he tested the evening's milk and the morning's milk. The evening's milk and the morning's milk were not always done on the same day, but upon consecutive days, and if I read out the tests that he gave me it will show what I mean.

7488. Before doing that, will you tell us what became of the other tests that were made?—These tests that I have been giving you now have all been sent up to Mr. Lloyd within the last four or five weeks—in March or April.

7489. (*Mr. Farmer.*) Were they all housed cows?—All housed cows.

7490. But not all grassed?—The last case, the one I am dealing with now, wrote to me saying they had been turned out to grass during the day, but I am sure they had been housed at night.

7491. (*Chairman.*) How many cows were there in the herd fed on highly nitrogenous food?—Eighty. As I say, his morning's milk showed 3·44 percentage of fat

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and the evening's milk showed 4·52 percentage of fat. Now, I put this example forward to show the necessary variation in these tests. Two years ago, in 1898, he had had some complaint from his retailers—from different men—and he sends to two or three people, and on February 2nd he tested the churns that went to Shaw and the churns that went to Board. Shaw's evening milk showed 4·2 and the evening's milk to Board showed 4. That is the evening's milk sent out—two or three churns to one man and two or three to the other. On February 3rd the morning's milkings sent out to these men were tested, and Shaw's showed 2·8 and Board's 2·7. On the following morning, February 4th, the morning's milkings were again tested, and Shaw's showed 2·7, Board's showed 2·5. Those tests were done by the Gerber. Then the evening's milkings were tested on February 8th, and Shaw's showed 4·3 and Board's 4·6, and another sample of Board's showed 4·4. On February 11th the morning's milkings of Board showed 2·6 and the morning's milk of Shaw showed 2·9. On February 18th Board's morning milkings were 2·8 and Shaw's 3, and Kirby's 3·1. Then, on the 21st February, Board's morning's milk showed 2·6 in one churn and 3·7 in another churn. In the evening the percentage was 5 on a date that he has not given me. Shaw's milk showed 2·8 in the morning and 4·5 in the evening, and Owen showed 3·2. On the 22nd February, in the morning Shaw showed 2·8 and in the evening 4·7; and Board in the morning showed 2·7 as against 4·3 in the evening. Owen showed 2·8. I only put these figures forward to show my point as to the great difference there is in the evening's and morning's milk when the intervals are so accentuated, and, not only that, but that from well fed cows extremely low results may sometimes be obtained. In this very case, in which almost the same food is used, when the sample is taken the other day the milk shows 3·44 in the morning and 4·52 in the evening. These results that I have read out to you were taken with no object whatever but by the man himself to see what his milk was. Then there are two or three tests at another dairy, showing, in one case, 3·40 in the morning as against 5 per cent. in the evening. The total solids in the morning are 12·60 and in the evening 13·55. In the other case the percentage of fat in the morning is 3·50 and other solids 9·10, giving total solids 12·60. In the evening the percentage of fat is 5·30 and other solids 8·39, giving total solids of 13·69.

7492. You gave us tests in the first instance that were being taken by the public analyst—in the first series?—The whole of those series of tests that I have given you were done by Mr. Lloyd, except the consecutive tests in February, 1898, that I have read out to you, which, of course, were very striking to me. They were done by the man himself with a Gerber tester, and you can see that they have been done consecutively.

7493. Is there not any liability to error?—I asked him if he had got any confirmation, and he sent me some analyses. There were one or two analyses of his milk about the same date taken by the milkmen which corroborated the fact that a low sample of milk like this, showing 2·5 and 2·6, had been sent by the milkmen to the analyst as the result. I do not mean to say every one of these tests has been corroborated by analysis, but he told me that he duplicated them several times—in almost every case he repeated the test, and, of course, it was his point to find out that he was not producing so low a milk as his test showed.

7494. From these figures and facts you think it would be dangerous to fix a standard that would be too high?—Yes. I mean to say, unless you revolutionise the whole of the milk trade and order at the same time that they must approximate their hours, there will be great difficulty in administering even such a low standard as 3; that there would be no safeguard; that you cannot reasonably expect that the cows will give you the same verdict four or five days afterwards. You can support that if you like by any analyses done consecutively day after day. And you will see by them that a herd of cows will vary. There are not many analyses that you can look at to show it, but you can look at the experiments conducted by the Bath and West of England Society, and if you look through the analyses for five or six years you will see the analyses give the quality of milk yielded by a mixed herd day by day while the cheese is being made, and you will see the total solids and fat can vary from day to day by ·3 or ·4. Therefore, I ask if you fix a standard of 3, how can you possibly safeguard a man? I am not advocating the production of a poor class of milk by any means, but I think that even supposing milk is to be considered not genuine till it is proved so, I do not see how the man is going to establish a defence if his cows do not support him. If, for instance, milk is taken on a day when there have been two or three cold days and nights running, and then the weather changes to warm nights and days, the difference in the milk will be certainly very marked.

7495. But, still, you say yourself that if it were fixed at 3 it would be a low standard?—Yes. I quite admit that. I myself certainly would not be content as a consumer to receive milk showing only that, but I would be perfectly content to admit that occasionally the milk might fall below that.

7496. And still be genuine?—And still be genuine, certainly.

7497. What do you really think it would be safe to define as the limit supposing we are asked to recommend a limit?—I do not think myself that there would be anything gained by fixing a limit. The great advantage to the public is that in every possible way they should get genuine milk, that is, milk as it is produced, and milk as it is produced will always vary from different cows according to the season and at different times, and also in the morning and in the evening.

7498. You heard the evidence of the last witness, did you not?—Yes.

7499. And you heard him say that in that part of the country, at all events, there was no difficulty whatever in their getting a very much higher standard than you have seen produced?—I think if you were to take my analyses you would find as to the average of the morning and evening milk that I have given you that my figures are quite as high as his, if not higher, if you averaged the two.

7500. He did not give us the difference between morning and evening?—If you average mine together and take these figures and work them out for yourself, you will find they are higher. Take the very worst case of the lot, and mix the milks fairly. Here is the very worst morning's milk, 2·87, while the evening's milk was 4·30. Now, to mix this milk would be to put two gallons of poor morning's milk to one gallon of rich evening's milk, as that is about the proportion they were giving—three gallons a day, one gallon in the evening and two in the morning. Now, if you multiply 2 87 by two you get 5·70, and if you add 4·30 that gives ten. The average of that man's milk in fat is 3·3 on that day. That is the average milk, and that is a very low one. If you were to average it all through you would not, I think, find anything else mixed together like that that would give it lower than 3·33. There are 3·15 and 3·9, but that you must not take quite as two and one. That is a case of nine and fifteen hours. It would be a little better than that if you were to mix it; it would come out about 3·4. There is a difference in the time of milking in that example. If you take the man who approximates, that is, a man who milks at 12 and 12, his morning's milk shows 3·30 and the evening's milk shows 3·62, and you can take an even quantity there. He gets as much in the morning as in the evening, and it would be 3·46. Of course, there are others here which I have read out to you which are really very much higher than those given by the previous witness.

7501. Yes, because the evening's milk reached up so very high?—Yes. If you fix a standard it would be necessary almost that they must alter their system. Supposing you get everybody to milk at 12 and 12, or even at 11 and 13, there would be some danger then, no doubt, but the danger is aggravated by the prevalent system all round the suburbs of London, and, as far as I know, it is extremely prevalent all round the suburbs in many large towns. I suppose it is worth some money to them. It is not worth quite all they say. Here is a case of a man milking 175 cows, and he says it is worth 2d. a gallon to him. I say no, you could get more milk if you milked at regular intervals, and he said, Yes, certainly. Another man said it was worth 1d. per gallon to them to have the warm milk trade, and not to have to compete against the country, and that I think is nearer the mark. The man with 175 cows retails a great deal of it himself, but he sends a great deal of it also to retailers in the suburbs.

7502. He will have a very low average in the morning?—Yes, but in four or five days it jumped up to 3·20 from 2·87.

7503. But if he goes to market, even if his milk is saleable, he will run against a higher standard?—I thought Somerset House did not condemn milk under 2·75.

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7504. (*Major Craigie.*) There has been a change in that respect?—I did not know that.

7505. (*Chairman.*) Has he suffered at all?—No, not that I know of.

7506. If he did he would have to alter his system, apparently?—I do not know. He would have to take his chance, I suppose. I do not mean to assert for one moment that his milk is always or is often as low as 2·87, but there it was on the morning that it was taken for me.

7507. (*Mr. Cowan.*) Might not it be that the sample was not properly taken?—No, I think the samples were extremely carefully taken. Of course, I do not know whether I should traverse upon other evidence in taking such results as have been shown, and that were brought out by daily analyses at the cheese schools at the Bath and West of England Association. Possibly Mr. Lloyd has been here, and I should traverse his evidence in doing that, but in 1892, at Axbridge and at Butleigh, the analyses of the morning's and evening's milks in April were as follows: At Axbridge it was 3·06, that is, the two mixed together, and the solids were 11·75. I was so struck with this that I turned to it, and I saw that on seven days out of twenty-two in April the mixed milk fell below 3, and these cows were said to have been turned out to grass and receiving some small quantity of cotton cake; in April, 1893, at Butleigh, the average of the mixed milkings was 3·09, and the percentage of total solids for April was 11·89. Of course, they went on increasing in quality as the cows gradually lessened in their milk yield. But in Butleigh, in April, there were four days in which the mixed milk fell below 3. Almost the same results were obtained in May. At Axbridge, in 1892, the average of the two milks together was 3·12, and there were nine days when it fell below 3, while at Butleigh there were six days when it fell below 3. It is but natural if you turn cows out to grass and they are in full milk, that they will find the grass is just as stimulating as grains, for there is nothing that gives cows such a fillip as grass, and they produce as much milk as they are capable of, but, of course, it suffers in the quality.

7508. Then you would advise us, as I understand, to leave things as they are?—Looking at it from one point of view I do not see why the public should have the 3 per cent. standard legally flaunted in their face, and why it should be thought that they should only expect that 3 per cent. was good enough for them. They ought to fairly understand that they should very very seldom, get a milk lower than that standard. Their milk ought always to be, or generally ought to be above it, and often very much above it.

7509. What do you say to it being stereotyped by law?—If it were stereotyped by law you would gain nothing I think, as at present there is a sort of feeling in the public mind, and in the farmers' mind, that genuine pure milk is the thing. You will find all milk buyers, I think, want to buy pure milk. They do not want it tampered with in any way, and all milk consumers would much sooner know that they are buying the pure milk just as it comes from the cow than milk toned down or toned up.

7510. (*Mr. Cowan.*) From what you say, it would almost seem to show that there had been no prosecutions at all in the country for adulteration. If you leave matters as they are you would seem to say that the consumers were quite pleased with the quality of the milk they are getting just now, and it is generally understood that they are the very reverse, because where the prosecutions take place it has been proved in some places—for instance, in Scotland quite lately—that they tried to stop this sort of thing by fixing a proper standard in order to reduce adulteration?—I do not see why the prosecutors should not go on just as well without fixing the legal standard. The chemist will tell you what his standard is whatever it is, and he will tell you whether it is genuine milk or not.

7511. But how can they prosecute unless they know what they are prosecuting for. There must be some standard?—But they do prosecute.

7512. But if the chemist has not a standard, what then?—But the chemist has a standard.

7513. But the chemists cannot give the law?—They have given the law hitherto. A prosecution might be obtained and can be obtained at present without putting before the public that 3 per cent., or whatever you may fix upon, is the thing that milk should be. Milk should be very much higher.

7514. But do not you suppose if a standard was really fixed at 3 per cent. it would reduce substantially the amount of adulteration that takes place?—No, I do not think it would. I agree with the last witness, and I certainly think it would lead to a great deal of toning down.

7515. But then it would be better milk than the consumer is in the habit of getting now?—No, I do not think so. That is a very difficult thing to pronounce an opinion upon, but I should say that is not so. Of course, there are many breeds of cows that would be very seriously affected, and it would be perfectly superfluous to go into an analysis of Dutch cows' milk, and, if you take a herd of Dutch cows, from what I have seen of Dutch cows' milk I do not see how you can possibly come up to a moderate standard.

7516. Why should people be allowed to keep an inferior class of cows then?—I do not see why they should not be allowed to produce genuine milk, whether it is produced by Dutch cows or not.

7517. (*Chairman.*) We had evidence this morning that the red polls gave the best quality of milk?—There must be, then, several classes of red polls, because we had five red polls at the Dairy Show in 1898; the average of fat in the morning was 2·85. We had seven at the Dairy Show last year, and the average in the morning was 2·93. Now, those are cows which are extremely well fed, and they are under every advantageous circumstance in the way of feeding. In the evening their milk showed 3·77 and 3·86.

7518. We are told that at their own homes, and not at a show, they produce extremely good milk?—There are two classes of red polls, I think.

7519. (*Major Craigie.*) I think I heard you say just now that you saw no reason why milk should not be sold according to quality?—Yes.

7520. Do you suggest that there ought to be two or three prices for milk, as primary and second class milk—different grades of it?—I have tried to think out a scheme, but it is impossible, I think. I think there ought to be more publicity given to the composition of milk. I mean to say, a milkman should be compelled to put up an analysis in his window of the milk that he sells.

7521. It is the case now, is it not, that many of the large companies, or some of them, do buy milk guaranteed to come up to a particular standard?—Yes, I think they do—I know they do.

7522. Then is there any case you know of in which milk, as such, is sold at a higher price than other milk that they sell?—No, I am not prepared to say. I have an idea that I do know one or two cases where milk is sold at one or two prices, but I should not like to give it in evidence now. I would not like to put it in evidence, but I think there are cases in which the milkseller has offered the consumer milk at two different prices.

7523. Have you any experience of attempts being made to sell milk at two prices and those attempts being given up?—No.

7524. As representing the British Farmers' Dairy Association, I gather we are to take your opinion, although not representing any collective resolution, as representing the general trend of opinion, as far as you can gather it, amongst the members of that association?—Yes, I think so. I believe two gentlemen have given you evidence—Mr. Middleton and Mr. Carrick—and also Mr. Primrose McConnell has been before you, and I think my evidence, showing the danger of fixing a standard, or guaranteeing a low standard of milk as genuine, has been put by Mr. Carrick and Mr. Middleton, and they have both written to me to the effect that it would be very difficult to fix a high standard, and they advocate a low standard to be safe.

7525. My question was rather a more general one. You gave us generally just now the impression that no gain would accrue by fixing a legal standard?—That I would not commit the British Dairy Farmers to saying. I stated at first, I think, that they are a collective body, and you could not get opinions to agree, and that some are of that opinion and some are not.

7526. There is no opinion on record?—There is no consensus of opinion.

7527. To the effect that a standard is not wanted?—No, certainly not, because some are very much in favour of a standard. But I myself am in favour of a standard if you can show me how you get out of the difficulties of the situation. It is only the difficulties in the situa-

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tion that force me not to advocate a standard. It is the difficulty of saying why you should pull up a man when he produces good genuine milk and he is left no terms of defence.

7528. The terms of Section 4 of the Act under which we are sitting now are to consider whether there should be a standard which should raise a presumption until the contrary is proved?—Yes, but I say the difficulty is to prove the contrary. I say that these cases do occur at certain times of the year, and particularly when the milking periods vary, and there are many other circumstances—everybody knows what they are—and milk will then fall below that standard, and I say the cows are not a reliable witness say within a week afterwards. They might support the evidence at first, and they might not, and where is the man's defence? The presumption is raised, and he has not proved the contrary, and is he to be allowed to appeal till he gets confirmation?

7529. Your point is that in a number of cases, although not very great, an injustice would be done by raising the presumption against him?—Yes.

7530. And you say, therefore, that the Act in suggesting the fixing of a standard which should call upon the man to show cause, is doing an injustice to certain individuals?—Yes, I think so.

7531. And in particular to those who have to milk at long and irregular intervals?—Yes, certainly.

7532. Now, with reference to the point as to cream. You suggest that cream should not be sold as cream if it contains less than 20 per cent. of butter-fat?—I make that statement, but I really do not know that I have any right to speak upon cream, but I take it with a separator you can separate milk of any quality you like. Therefore I say what is natural cream? When I was a butter manufacturer I did not use a separator. My cream was obtained by running the milk off from underneath. Well, what was the result? In the spring, say in May or June, when the cow is brought to grass and the milk is what you might call of first-rate quality and the cream rises well and quickly, the cream goes closely together, and one would find, as a matter of experience, that about a quart of cream would make a pound of butter—that is about four pounds to the gallon. I believe the previous witness has said he could get six pounds out of a gallon, but I think that is almost an impossibility when you skim it. In the winter, when the cream rises slowly, it would be in a less close volume and very different quality, and, as a matter of fact, we found that it would often in the winter take about two quarts to make a pound of butter. That is natural cream, and nobody could object to my selling it as natural cream. It is a simple matter of calculation, that if two quarts of cream went to produce a pound of butter you may say there is 20 per cent. of butter-fat in it.

7533. You suggest there would be no danger in fixing a standard for cream then?—I should not at all mind, but it would be unfair to say that this cream must not be sold. Therefore, my idea in putting that forward was to show that 20 per cent. cream is a naturally thin cream.

7534. That would be in contradiction to what the last witness said?—It is not produced by the separator. Anybody who knows a separator knows that you can separate thick or thin cream, but if you take cream as it rises naturally and run the milk from underneath it then when the milk ceases to run there comes the natural cream. My point is that in the winter, when cream rises slowly, natural cream is thinner than it is in the spring or summer, when it goes into a small volume.

7535. Then, have you any experience of cream of different qualities being now sold at different prices according to its quality?—I always understood in London there was thick and thin cream, or tea cream I think is the term. Twenty per cent. is what fairly might be sold, I think.

7536. On the whole, do you think there would be any harm or otherwise in fixing a standard for cream or more than one standard for different grades of cream?—I think if you meddle with cream at all you might fairly draw up two standards. I have said in my evidence that you cannot fix two standards for milk, but not as to cream, because you certainly can have both thick and thin cream.

7537. (*Chairman.*) I suppose you would like, or you would suggest, if anything, that there should be two standards of cream?—Yes, I think that is very fair.

7538. That is that the lower standard in cream should contain at least 20 per cent. of butter-fat?—Yes, precisely.

7539. (*Mr. Barham.*) You come here as the representative of the British Dairy Farmers' Association, do you?—Yes.

7540. That is rather an important association, is it not—one of the most important connected with dairy farming?—Yes, I should think so.

7541. There are nearly one thousand members, I think?—Yes, I think so.

7542. With regard to yourself, you are not engaged at the present time in the dairy business, are you?—No, I am not either a producer or seller at present. In fact, I am simply a consumer. I have no interest in anything at all in the way of either production or supply.

7543. But you have been a producer for many years?—Yes, certainly, for a great many years.

7544. And, of course, you have exercised your observation during that time very largely with regard to dairy produce generally and milk in particular?—I have tried to keep an open mind on the question. When I was a producer I remember distinctly that when the question of raising standards came up, I myself was always very much in favour of the standard being fixed, but now, when I have looked at the whole question right round and seen the variability of milk and the difficulty of corroborating evidence, I fail to see how a standard can be properly applied. If you give a man an order to make whiskey of a given strength you can do it, and if you give a man an order to make beer or brandy or tobacco to a given strength you can do it; but I will defy you to tell the cows to turn out a level standard of milk.

7545. Then, I think you have acted as judge at many of the leading agricultural shows?—Yes, I have.

7546. And you have acted as judge with regard to butter tests and milking trials, and also in judging of some of our leading breeds of dairy cattle?—Yes.

7547. And you have examined on many occasions for the diploma of the British Dairy Farmers' Institute?—Yes.

7548. And for the Association?—Yes.

7549. You have not mentioned any of these things in your *précis*, and I thought it was only right that the Committee should be aware of that fact. I think you were trained at Cirencester College?—Yes.

7550. We have heard that you think it is not desirable to fix a standard, but if a standard were fixed you think it would not be sufficient to fix a higher one than 2·75 for fat and 11·50 for total solids?—Yes, but that is not all the milk ought to contain. I cannot see my way out of the difficulty unless you fix an extremely low standard, and that is why I am averse to fixing a standard at all. There are these variabilities in milk, and I do not see any reason why an innocent man should be pulled up and thrown under a cloud just for this, when he is innocent of any offence at all. I do not wish at all to defend poor milk, on the contrary, I am inclined to think that the quality of milk should be kept quite as high as it is at present, and higher if possible. There is one point I might press, and that is that I really think that very great good might be done in this way perhaps—there is such a thing as having a standard of cleanliness as well as a standard of quality. If you were to see the milk that is produced in the country districts out of the running of public officers and health inspectors, and the way in which cow byres are kept, you would say that a standard of cleanliness as regards that milk would be of more value even than a standard of quality. Then there is one other point which I was asked to bring forward, and possibly I may be allowed to do it, because it was pressed upon me by a member of the association, who is an extremely practical man and very thorough in all he does, both in the way of practice and of science. He was very keen upon the point of when the samples were taken. This is the prevalent system. The churns are filled at the dairy, and they are put in a two-wheeled cart or they are put in a perambulator and locked at the top, and wheeled round, and the man draws off from the bottom into a two-gallon can, and goes on till he has finished the milk. I suggested to him that surely the agitation of that churn as it is wheeled along is quite enough to keep that milk in a fairly satisfactory condition, but he said he did not think so. So I asked a well-known milk-dealer whom I knew if he had any evidence which he could give me on the point—I asked had he ever made any investigations to show the result in his own defence, and he sent me to illustrate the importance of the point nine pairs of analyses. They were taken in June, 1896; September, 1896; February, 1897; August, 1897;

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August, 1899; October, 1899; November, 1899; March, 1900; and April, 1900. I might explain his system, because I was careful to ask him how it was done. It is this—he puts the milk into a big receiver, and then the men's churns are filled up at once from that receiver, and a sample is taken of that bulk, and it is put in his cupboard. If the milk is sampled on the round and taken for analysis there is his check. So he sent me nine pairs of analyses which had been taken. In some cases the sample taken on the round was poorer, and in some cases richer, and that brought out my friend's point as to there really being that difference. On the 5th of June the sample at home showed 3·87 of fat, and that, I take it, is the genuine sample, because it was sampled as soon as the bulk was mixed and taken away. The sample that was taken for inspection showed 3·49 of fat, that is a difference of ·38 to the bad.

7551. (*Major Craigie.*) What was the method of sampling employed?—They were both sent to a public analyst. In September, 1896, the difference was ·16—that is nothing. In February, 1897, the difference was ·45 the other way—richer—that is, that it came from near the top of the churn but still it shows the faults of the system whichever way you take it. The milk at home showed 2·9. That is from the same man who sent me a short time ago the analyses of 5·0 in the evening's milk and 3·40 in the morning's milk. In the pairs of samples taken in August the difference was ·03 and ·10 only. In November, 1899, his milk at home showed 3, while the samples showed 3·44. On the 27th of March his milk at home showed 4·7, and the samples taken showed 4·35, that is a difference of ·32. There is a difference of ·40 on the 8th of April—his milk at home showed 3·8, the sample taken showing 3·4.

7552. How long after was the sample taken—what period elapsed?—The sample would be taken on the man going on his rounds. His round would not take more than two or three hours, I think, although I do not know what the milkman's round takes. But as I was giving evidence for the Association the point was brought to my notice by a member, and I tried to get evidence, and these samples were sent to me by a member of the Association with the dates when they were taken. It only shows the difficulty of taking samples. There is only one time, I think, when the cows can be fairly sampled, and that is when the whole of the milk is poured together and stirred, and the sample taken at once. It is a side issue on the question, but it will be a question that will affect the matter if a legal standard were enforced.

TWELFTH DAY.

Friday, 4th May, 1900.

PRESENT:

Lord WENLOCK, G.C.S.I., G.C.I.E. (*Chairman*).

Mr. GEORGE BARHAM.
Mr. GEORGE COWAN.
Major PATRICK GEORGE CRAIGIE.
Mr. S. W. FARMER.
Mr. SHIRLEY F. MURPHY.
Professor T. E. THORPE, F.R.S.

Mr. R. HENRY REW, *Secretary*.

Mr. F. E. Walker.

Mr. F. E. WALKER, called; and Examined.

7553. (*Professor Thorpe.*) You are the Agent of Lord Wenlock, the Chairman of this Committee?—Yes.

7554. You have managed his factory for ten years, I think?—It would hardly be as long as that—it is about eight or nine years.

7555. You have had, therefore, considerable experience in the trade in milk, in Yorkshire especially—and elsewhere, I presume?—In Yorkshire only; I never really dealt with it before going to Yorkshire. I have been in dairying counties, but not to deal with milk.

7556. Your experience is mainly then connected with the management of Lord Wenlock's factory in Yorkshire?—Yes.

7557. I believe you have some ideas to present to the Committee as to the difficulties which present themselves to your mind if anything like a uniform standard is fixed?—My own idea is that there is much variety in milk as at present produced; genuine milk is produced with 2·4 of butter fat in it, and it may go up to 5 or 6 per cent. of butter fat. Of course, 2·4 is not recognised, but it all is genuine milk as produced from the cow, and, therefore, is entitled to be treated as genuine milk and is put on the market at a uniform price, speaking generally. This is very unfair on the producer; it is very unfair to the consumer, and the whole tendency has been, looking at it from an agricultural point of view, to deteriorate the herds of dairy cows in England. It is far easier to breed a cow that will give a large quantity of inferior milk than to breed a cow that will give a large quantity of fair quality; therefore the tendency has been to simply get a cow that will give as much as possible, irrespective of quality. That, I think, has had a very marked effect. I know I was struck with it some few years ago, when we started, on going round Lord Vernon's factory in Derbyshire, where there were magnificent herds of cows in former days. They are now all deteriorated to what I call animated milk pails.

7558. You think, therefore, that if this Committee were to suggest or to form a standard, and that standard were to be fixed too low, the natural effect of that would be to depreciate the character of the herds, and, therefore, of the milk supply of the community?—I think so; I think that has actually taken place so far.

7559. You are so strongly of that opinion that you think it very desirable even now, from a national point of view, and to the ultimate benefit of the consumer, that some steps should be taken to counteract this tendency?—Yes, I certainly think so.

7560. Is the milk which is usually sent into towns by milk producers of a fairly good quality, in your opinion?—I think it is, speaking generally, of a good quality. I think most milk buyers in towns fix a minimum, and that farmers take little or no trouble as long as they know they are up to that minimum standard. They very often, therefore, send milk far richer which has to be dealt with in town to bring it to the requirements of the present standard as far as recognised.

7561. Is it within your knowledge that milk is so frequently dealt with by wholesale dealers in milk?—It is very difficult to actually say. I can only talk about provincial towns, like Leeds. In Leeds we had this practical experience, that where we sold separated milk to which cream had been added we could sell that to make a profit at 8d. a gallon, and the purchaser stated that there was more cream on it than on the so-called new milk, which they bought at 10d. In dealing with milkmen they have always made the statement openly; I have no direct evidence on the point, but I think it is generally recognised that milk is reduced when it is rich in fats by adding skimmed milk. I maintain that if a fair price had been given for rich milk it would be impossible for the retailers to sell it at 10d. a gallon to pay a fair price and make a profit on it. Therefore, that milk must have been treated in some way to enable them to put it on the market at 10d. a gallon, which is frequently done in Leeds.

7562. It is not quite clear to me how it is commercially possible to fortify skimmed milk with cream which has presumably not been watered, and get a product which eventually is even richer than the fresh milk?—It ought not to be.

7563. I do not see how that is commercially possible?—It ought not to be if tests were taken properly of the new milk sold. This was advertised as separated milk and sold as separated milk from which the whole of the cream is not extracted.

7564. Let us be quite clear about that. You say that in Leeds milk can be so manipulated that separated milk is, if I may so call it, fortified with cream, and a product is obtained with which the consumer professes to be even better satisfied than he would be with the whole untampered milk; I think that is what you said?—I maintain that he does not get untampered milk.

7565. Of course, in a sense, he does not get it untampered; he gets a product which he is satisfied with, and it is richer in fat than it would have been if he had taken the new milk?—Yes—the so-called new milk.

7566. I do not quite see how that is commercially possible; would you explain to me how it is possible?—It is not, if the so-called new milk was properly inspected and samples taken; then it would be impossible to sell it. The new milk is sold in Leeds at 10d. a gallon which is inferior to separated milk to which cream has been added, and the separated milk to which cream has been added can be sold at 8d. at a profit. That is a plain fact which exists.

7567. That is a condition of things which in your mind leads to a good deal of dissatisfaction in the trade—at all events to the honest man?—Yes, it does.

7568. Will you explain to the Committee how?—The public, unless there is anything that they can get hold of such as the separated milk to test it by, have no means of testing their milk. They buy new milk at 10d. a gallon, and there is a demand for new milk at 10d., and, therefore, the milk cannot be sold at a fair price. I do not think milk, speaking generally, can be sold much under a shilling a gallon in towns, but that milk being sold at 10d., the public get it into their head that they can buy new milk at 10d., although it is in fact inferior stuff and is not worth it, and the retailer makes it a lever to reduce the price of the farmers' milk to him. Therefore the farmer loses really; he is supplying rich milk which is lowered by adding skimmed milk, or separated milk, which is practically the same thing; indeed, both the farmer and the consumer lose owing to its being possible in towns.

7569. I think your remedy for that condition of things is some system of grading milk?—Yes.

7570. Would you explain to the Committee what your method would be?—My own idea—of course, it is only my own idea, and I do not wish to say what really should be the grade—is that if the question is gone into with some such standard as 3·4, it will be found to be representative of the bulk of the milk produced from fair herds of cattle in England.

7571. All the year round?—All the year round. Of course, it would vary, there is no doubt; but 3·4 might be a standard that could very shortly be got up to, and there is no necessity for going below that.

7572. That 3·4 means morning's and evening's milk?—Yes.

7573. And all the year round?—Yes. I say whatever is decided on as the standard should be the milk of the country, and should be the first-grade milk.

7574. Pardon me; I think your argument is that the average milk is 3·4, is it not?—Yes.

7575. That is your datum line, so to speak?—Yes.

7576. You go above and below that?—Yes.

7577. But the average milk is 3·4?—Yes. I think with a little care and trouble 3·4 ought to be the minimum of the average milk. If you take that as the first grade—as what the public should expect as good, honest milk—you then can go below that to whatever the Committee think is possible to be produced—I should say as low as 2·4—as a second grade milk.

7578. Does that imply any remark as to its genuineness or not?—Of course, they all must be genuine. Then I think it would be only fair to the producer that a very high quality milk should be sold as an extra grade. I have only put down quite roughly that 2·4 should be the second grade and 3·4 the first grade, and 4·4 the extra quality; whether that 4·4 is quite high enough I do not know.

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7579. The numbers that you actually do suggest are, I presume, what you have thought over as being practicable limits?—I do not think they are practicable just at present. The 3·4, in my opinion, is not practicable at present. If any such high standard was adopted as the first grade, I think it would be only fair to everybody connected with the trade that they should be given a certain time to come on to that limit; that is, that it should for the first year or some such period be put a trifle lower.

7580. And, then, may we gather that 3·4, which you say you think is the average of good honest milk, is even not now attainable?—Not at all times of the year; with the morning's milk it would be difficult to get it, and it is a thing that would have to be worked up and more attention paid to.

7581. Are you in a position to tell the Committee what would be immediately possible as regards the average character of the milk?—I should not like to place my figures as being thoroughly reliable; there is such a difficulty in testing milk for reliable information; you have to take into consideration the time of the year, the time of milking, and everything else. Speaking roughly, I think that if a herd of cows are mixed so that they are not all new calvers, and that there is a certain proportion of them that have been in milk some time and that they are not milked at very unequal hours—I do not think that intervals anything like ten and fourteen hours would affect the question—there would be little or no difficulty in bringing the morning's milk up to the average of 3·4—or 3·2, now, certainly. I have a few cases of tests of cows taken showing the morning's and evening's milk, and I have a schedule showing the bulk tests taken from the milk as supplied to the dairies by the different producers, the morning's milk being kept separate from the evening's milk and tested. The variation is very little in that. I can hand the schedule in, but I have unfortunately not got it here. I will send it.

7582. Can you tell us generally what is the upshot of the figures; are you sufficiently familiar with them to do so?—I think it varies about 0·4 per cent. between the morning and the evening, speaking generally.

7583. The interval of milking being what?—The day is divided into about ten and fourteen hours. I have figures here showing the bulk tests of all the milk sent to the Escrick Park Dairy for the last three years. The difficulty about this is that the morning's and evening's milk are mixed in those Tables; it is on the average taking a rather larger sample of the morning's milk than of the evening's milk. It is tested at the end of every ten days. That shows that 3·4 is the average milk, but then that does not bear out the difference between the morning's and the evening's milking.

7584. Have you considered what would be the practical working of a system of grading milk; would it not introduce other complications, such as the possibility of a false representation on the part of the trader and the usual conflict of testimony which goes on as to what was asked for? Supposing, for example, somebody went in and said they wished to buy first grade milk, and were served with second grade milk; looking at it from the point of view of a legal process, how is that conflict of evidence which would ensue to be got over?—I think there is less chance with the different grades than with the one.

7585. Less chance of what?—Of so much conflict.

7586. Assuming for the moment that the Board of Agriculture adopted the principle of this suggestion, and we arranged the milks according to grades, how is the consumer to be certain that he gets the grade that he has asked for?—Of course the consumer, speaking generally, has not means of ascertaining. It can only be done by inspection. It is like everything else. If a man when he has the chance sells second grade milk for first grade milk, he ought to be dealt with very severely.

7587. Yes, and if he is not dealt with under Section 4, he would have to be dealt with under some other Act, or by some other process than is contemplated in this Act. Is there not, moreover, this difficulty, that we are implicitly recognising a low grade milk as being a regular genuine article?—Yes.

7588. We are recognising the possibility of it may be large quantities of milk being as low as 2·4?—Yes, I have put that down.

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7589. Assuming that it became a question of price—which, of course, it would be—it is entirely a question of price?—Yes.

7590. Might not the tendency of this be that you would have a very large quantity of milk, especially in the poorer districts, sold of a very low quality?—You get it now.

7591. You do not get it so low as 2·4?—I did not tie myself to these figures at all. There, again, just like the 3·4, I think you will have to start lower and raise them in time.

7592. Of course, it is very difficult to say what the average consumer in poor districts does get, but he certainly does get something between 2·5 and 3 per cent., or even higher, as a rule?—Yes.

7593. Now, by practically legalising as you would do by a Board of Agriculture regulation a milk with a relatively low standard, you familiarise the public with the existence of that; large quantities of it, it may be, would be prepared, and the general milk supply of the country might be by that depreciated?—With one standard only you cannot put that one standard very high.

7594. No, you cannot put it too high, but you might put it reasonably high so that it did not operate harshly upon the producer. Would you think, for example, that the general standard of 3·25 would be too high?—I think so, as a general standard; at all events, to start with.

7595. You yourself are not able to foresee any practical difficulties in working out this system of grading, assuming that due time is given to bring it into operation; have you thought that out?—Yes. I think if a man chooses to put his milk into a higher grade than it is entitled to go into, he then knows what he is doing, and it is not a question of his cow.

7596. Of course, that would necessitate his testing, would it not?—Yes.

7597. Continuously?—Yes.

7593. Practically every day he would have to do it?—No. I do not think the bulk tests vary like that. My own idea is that testing individual cows is testing the milker, not the cow.

7599. You mean to say whether the cow is properly milked down?—Yes. When you come to large herds the little variation in individual cows is practically corrected, and you get a uniform quality of milk, speaking within reasonable limits. When you come to the very small herds they are then the property probably of a small owner, and we are dealing with the poor man, who is the man that you want to protect in any official system. He milks for himself; he is directly interested in them, and there is not the variation in the milking of the individual cow that there is in the larger herds. It corrects itself in practice.

7600. (*Mr. Barham.*) Are you putting those tables in that you have been referring to?—Yes. (*See Appendices XIX. and XX.*)

7601. (*Mr. Cowan.*) You stated that it is within your knowledge that milk is sold at 10d. per gallon in Leeds?—Yes.

7602. What standard might that be?—That is very difficult to get at. I should think a very poor standard.

7603. Do you think genuine milk can be produced by the farmer at such a price as to leave any profit to the retailer?—No.

7604. Have there been many prosecutions for milk in Leeds on the ground of adulteration?—I do not think so. I really have no information on that point.

7605. If they are selling a great quantity of that milk at 10d. per gallon, in your opinion it must be adulterated in some way or other?—Yes.

7606. But you do not know whether there are many prosecutions there or not?—I do not think the system of inspection at present tends to prosecutions. The inspectors are all well known.

7607. Then, in regard to the separated milk to which cream has been added which is sold at 8d. a gallon, have you any idea how that would work out into a standard?—No; I have never analysed it.

7608. You tell us that that milk is more in favour than the full milk which is sold at 10d. a gallon?—Yes, the so-called full milk.

7609. That will be just owing to the taste of the consumer, then?—What they always stated to our men was that they got more cream from the skimmed milk than they did from the new

7610. All the cream rises to the top of the separated milk?—Yes.

7611. In your part of the country, in Yorkshire, do they milk at regular hours?—Of course it varies very much; it depends where the milk goes. As a rule, the intervals are ten and fourteen hours, speaking generally.

7612. You have found very little difference in the result of the testing from morning and evening milk with the intervals of ten and fourteen hours?—There is a wide difference in individual cows.

7613. But in a mixed lot?—In a mixed lot I do not think there is a very great deal of difference; 0·4 I think will cover the difference in butter-fat. I have a short Table which I will hand in upon that.

7614. Do you consider there is any difficulty in your having regular hours of milking?—Near a town I think there are great difficulties.

7615. Where they supply warm milk, do you mean?—Yes.

7616. It would be no difficulty to the suppliers from whom you get your milk?—No.

7617. Because you take your morning and evening milk at the same time, and you have only one delivery?—No, two, morning and evening.

7618. I thought the two were mixed together?—No.

7619. You seem to advocate two grades of milk?—Practically three; a first and second grade and a higher grade. I call the medium milk first grade, because I think it would be very unfair to call it a second grade milk; it would give the public an idea that they were getting inferior milk.

7620. Is there any reason why milk should be produced as low as you state—2 4 of butter-fat?—No. As I stated, I have not any figures on that at all. I think that is more for experts who have experience in dealing with several milks than for me dealing with one class only.

7621. Do you think that should be encouraged all over the country generally?—My own idea is that you should start low and raise it from time to time, so as eventually to get on to the good quality of milk.

7622. If it was left for a period of months, possibly a year, after the standard was given out to the public and before it was acted upon, would that not be a sufficient time to allow the people to grade up their milk?—Yes. I think it would take nearly a year to do it, because the different times of the year affect the quality of the milk.

7623. What months do you find have the lowest average of butter-fat; is it pretty regular all over the year?—No. According to this last year, July, October, and, funnily enough, December, were the poorest. But, then, I think so much depends on other conditions. For instance, if the men that went in for dairying had a lot of cows calving at a particular time. I do not think it has so much to do with the actual month as with the number of cows that are calving at the particular time. I think you can keep a fairly average sample of milk all the year round by arranging the times when the cows calve.

7624. You will have found in your experience that when cows go out to pasture in the spring of the year, and especially if it is a wet time, that the produce of the cows at that time, though increased in quantity, must deteriorate in quality?—Speaking generally, I do not think that that matters very much. I put the whole of the butter-fat down to breed. I put the quantity down to mode of feeding. If you can get cows under the same conditions, I do not think, as far as feeding is concerned, that they will vary 0·2 in butter-fat.

7625. The milk, of course, is found to be poorer at such times as I am speaking of, but you would account for that, I suppose, by the extra quantity?—By the new calvers.

7626. And the extra quantity of milk produced owing to the rush of inferior grass just at the start of the season?—I should put it down more to the new calvers.

7627. It may occur where cows are calving regularly over the season that when they go out to the pasture at first, if the pasture is wet and there is not much sunshine, there is a tendency to give a larger quantity, which shows in a sense that the butter-fat is decreased, but which really shows that the decrease in the butter-fat is owing to the extra quantity of milk that they produce?—I have not the figures which contradict that statement, but my own impression is that the butter-fat does not vary very much, speaking generally.

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7628. Not by feeding?—No.

7629. And you think that breed has more influence over its production?—Yes.

7630. In speaking of two grades of milk, or even three, might it not happen that the lower grade would be frequently sold by accident on the part of the seller, as the higher grade?—He would do it at his own risk.

7631. Would it not very often occur that the lower grade milk might be sold for the price of the higher grade?—It might.

7632. Would that not be entirely to the prejudice of the consumer?—Yes.

7633. How would he be protected from that?—By inspection. I do not think that it is only in milk that the consumer is defrauded.

7634. What class of cows are generally reared up in your part of the country?—It is commonly known as the Yorkshire cow, which is really a non-pedigree Shorthorn. In the actual figures given in my Tables there will be eleven Ayrshires, one half-bred Jersey, one Jersey, and the remainder of the sixty would be non-pedigree Shorthorns.

7635. Do you think that the cross breeds give as good a quality of milk?—Better, as a rule.

7636. Better than the pure breeds of Shorthorns and Ayrshires?—Do you mean the crossed Shorthorns and Ayrshires?

7637. The cross between the Shorthorns and Ayrshires or whatever cross you have?—If there is a little Jersey in it, then the quality is very much better than the other, as a rule.

7638. Better than the pure breeds?—Yes; you lose in quantity, but you get it in quality.

7639. Would that continue until the second or third generation, or does it end at the first cross?—I think the first cross is the best, but I think where you have got a cross with a Jersey it nearly always tells.

7640. Have you had any experience of cows being crossed say a second or third time?—Going back to the pure breed?

7641. No, going further away?—If you cross a Shorthorn with a Jersey or unpedigreed Shorthorn, you must cross that produce again, I suppose, with the Shorthorn; is that what you mean?

7642. Yes; what happens then?—That would deteriorate.

7643. It would?—Yes; the less of the Jersey I think the more you would deteriorate.

7644. (*Mr. Barham.*) It seems a little mysterious, I think, to many members of the Committee why separated milk with some cream added should appear richer to the purchaser than the new milk itself. May it not be explained perhaps partly owing to the new milk being cool milk, milk brought by rail, and the separated milk being perhaps warm milk, and when the cream is added to it the cream does not amalgamate with it, if I may so term it, so readily or so evenly as the new milk, and, therefore, it rises to the surface more rapidly?—It might be partly that; but at first, before there was any machinery at Leeds, the separated milk to which the cream had been added was always sent by rail.

7645. And then was the separated milk better than the new milk?—Yes.

7646. (*Mr. Farmer.*) Could you tell us why you separate that milk and add cream afterwards; it seems a funny procedure?—There is a great demand for separated milk as separated milk in Leeds.

7647. If you are going to add cream to it again why do you not partially separate it?—Because then you would not know the exact percentage you have got in it. You see, there is not a great deal of margin in selling anything like that, and you must gauge to a nicety what cream you are selling with it.

7648. You told us that 3·4 was a possible average, I think, for the whole of the year?—I mentioned it as my own opinion. I am only speaking as from one district.

7649. Within your district?—Yes.

7650. Does that apply equally to April and May?—I think so.

7651. You make no difference between April and May and any other months in the year?—No, I put it all down to the question of calving, or practically so, that is, speaking generally.

7652. There is one observation I should like you to repeat; did you say July, October, and December were the poorest months in the year?—No. I say that, according to the figures I have put in, the larger proportion of milk at 3 per cent. was, as it happens, in those three months of last year, funnily enough.

7653. (*Chairman.*) A question about the grading of the milk; do you adhere to the three classes, or do you only think that at all events there should be two?—I think you must not have less than three. I think the producer is entitled to a higher grade price for the first class milk. There is no doubt that with Jerseys and Guernseys you get a very rich milk, but you do not get quantity, and if the public want that milk I think they ought to pay for it.

7654. Does it not occur to you that possibly if there were those three classes, the third class would become the more popular class?—The higher class do you mean?

7655. No, the lower grade, as on the railways; the great mass of the people would have a milk which bears, as it were, a Government stamp, it would be considered to be genuine, and they would say they would get the cheapest article, and the result in the end would be unfortunate, because the milk supply of the country would tend to lower down instead of going up?—If the public will buy it they know what they are buying.

7656. There is no doubt that they do buy the cheapest thing in the market—like the third class on the railways, they go for what is cheapest, and if a grade of milk which is pronounced to be genuine has, so to speak, a Government imprimatur on it, are they not likely to make that the great milk supply of the country?—I do not think so. A great many of the public buy milk and take the cream off it. The poorer classes might be willing to purchase this, but I think at present they would be more likely to buy the separated milk at a cheaper rate.

7657. They go still cheaper?—Yes.

Mr. J. P. Hoddinott, called; and Examined.

Mr. J. P. Hoddinott.

7658. (*Chairman.*) You are the Managing Director of the Great Western and Metropolitan Dairies, Paddington?—Yes.

7659. Is it one concern or two?—One concern, at present.

7660. In that capacity you purchase milk from the farmers in the western counties?—Western, north-western and southern counties.

7661. You purchase from them considerably over 100,000 gallons per week?—Yes.

7662. Do you contract with your farmers for a certain quality?—We put in our contracts 3·5 fat, but many of the farmers cross it out and say it is impossible to be met throughout the year.

7663. Do you stipulate for any solids not fat?—It must be pure, unadulterated, unskimmed milk, and it must contain 3·5 of fat. We have that clause in the contract, but it oftentimes gets crossed out by men who are quite honest and conscientious.

7664. You test your milk, of course?—Yes, we repeatedly test it.

7665. Can you give us the result of your test of all this milk?—At what season of the year?

7666. Will you present your figures—in any way you like to do it best?—There are four months in the year, speaking of the southern counties especially, in which milk is very much poorer in butter-fat and other solids are lower every week frequently.

7667. Which are those months?—It would begin sometime in February—early in February sometimes—the warmer the year the sooner it begins, strange to say—and March, April, May, and part of June.

7668. Have you any figures to show what your butter fat has run down to in those months?—We keep a record—in fact, I had some numbers of analyses, but I thought it was not quite honest to the analyst to show them, as they were not taken with a view of giving evidence, and the particulars were not given; but during those months

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there is a certain percentage below a standard of 3 per cent. of fat.

7669. Much below 3 in those months?—From 2·5 to 3. I may say there are very few below 2·75—very few indeed.

7670. Do you believe that those milks are perfectly genuine?—When they are 2·75, and it is a fair herd of cattle and situated in a fairly fertile neighbourhood, I should not question the genuineness of the milk.

7671. Even in those months?—Even in those months. On the other hand, there are certain districts—large districts—where for the four months you could not question the genuineness of the milk at 2·75 of fat, large and wholesome and healthy districts.

7672. Do they run down below 2·75?—They do occasionally run down to 2·75, but they are frequently below 3. My experience recently is that there has been 10 per cent. below 3 per cent. of fat, but that 10 per cent. is not always the same 10 per cent. It runs over about 30 per cent. of the farmers, especially during March, April, and the beginning of May. The general experience is that 70 per cent. of the farmers send over 3 per cent. of fat, and they go nearly all the year over 3 per cent. of fat. Out of the other 30 per cent. for three months at least 10 per cent. are under the 3 per cent.; but it is a most varying quantity. To-day you take a man's milk, it is below 3 per cent.; to-morrow it is over 3 per cent., and so they go on. We perpetually test the weak samples, but they vary day by day, week by week, all through those four months.

7673. When you get these milks under 3 per cent., do you sell them as they are, or do you mix them with others?—We sell them just as they are.

7674. You know what the present standard is for milk?—I think we hardly do know what the present standard is for milk just now.

7675. Have you had many prosecutions for selling milk under whatever the standard may be?—We have never been prosecuted ourselves.

7676. When has this milk ever been subjected to question by an inspector?—I could not say how far the inspectors have taken these samples, or whether the dairymen have been prosecuted on these samples or not. There is no time to test these samples when they are sent away. They are picked up out of the train and immediately sent away.

7677. An inspector may come across them in the course of his inspections and take samples from them?—Yes.

7678. To your knowledge this particularly weak grade milk has not been the subject of a prosecution?—I could not say; it has not come to my personal knowledge. These customers say they have been prosecuted—some of them for this particular milk as delivered.

7679. There have been prosecutions?—There have been prosecutions amongst the retail dairymen.

7680. On this particular milk?—I could not say.

7681. (*Professor Thorpe.*) But there have been amongst persons with whom you deal?—Yes.

7682. (*Mr. Barham.*) The whole of the Great Western and Metropolitan Dairy's business is wholesale?—All wholesale.

7683. (*Chairman.*) The dairyman taking it may have been prosecuted, and it may have come to your knowledge that this particular milk was the subject of prosecution?—Yes, but we could not say whether the milk was that particular milk of that particular day. We have no proof that it was a particular milk which was below a 3 per cent. standard on any given day. We have never had a case where we could have proved it. We have had cases where we have shown the tests of the farmers' milk taken many times and it has been below 3 per cent. with the same identical farmer. On the other hand, with great numbers of these farmers on this same land during the autumn theirs is some of the richest milk, some of the best milk which comes to London.

7684. Which counties would they be in?—They would be in several counties, but if you take a district running from Swindon through Purton, Wootton Bassett, Minety, even Cricklade, land does not show up very well.

7685. Wiltshire?—All those places are in Wiltshire. Large quantities of milk come to London from those districts.

7686. Do you go to Dorsetshire?—We may just go into Dorsetshire in the winter. We had, in fact, just one or two samples in the winter.

7687. You have shown us that in certain months you have poor milk. You have something to say as regards the food?—Yes.

7688. What is your experience of that?—The same principle seems to apply to a very great extent—that during these same months, as soon as the mild weather comes, the animals do not feed so well; they will eat all the succulent parts of the food, but you have a difficult matter to get them to eat sufficient of the dry, more nutritive foods.

7689. Is that what your farmers tell you?—I have been a farmer myself for many years, and it is a fact which I knew before I came into the milk trade, and which I have proved many times since.

7690. That is as regards the food?—Yes.

7691. When they are beginning to get on the grass you say they will not eat. Are they given those dry nitrogenous foods when they are getting on the grass?—Yes, but they will not eat them so readily.

7692. They will not eat them if it is not given to them?—They could not, could they?

7693. Is it not the custom of the farmer to give them extra food the moment they get out on the grass?—With the permanent standard of milk that we require it is rather the custom with them to give them extra food.

7694. You think they do?—I think so.

7695. You say, although they give it to them, they do not care to eat it?—They will not eat sufficient.

7696. Have you anything to say as regards temperature?—Yes, we find that the samples of milk in low temperatures keep of a better quality to a later period of the year than they do in the warmer districts. I imagine it is from the cold temperature of the cow that she can digest these richer foods. In Warwickshire and the sides of the Cotswolds, Bourton-on-the-Water, and all those places we find that high quality milk will continue some weeks later than it will in the warmer southern districts. I am speaking of poorer, warm districts, not of the richer warm districts.

7697. We have had witnesses here who come and say when the weather is cold at certain periods the cow requires more of her own fat to keep her going, and at those times of cold weather the milk is not so good; your experience is the reverse of that?—No, my experience is precisely the same when she is out of doors—the moment she goes out of doors in the spring of the year. To-day the temperature is 75 in the sun, and to-night it is within one or two degrees of frost—consequently the milk she gives to-morrow morning is very much deficient in fat, although the milk she might have given to-night has been quite up to a good average standard. The reason is simple; she has no coat on her; she has wanted that fat to keep her hot.

7698. You talk of the high levels in your *précis*—that is the high ground you have mentioned?—Yes, those and other high grounds. The question of temperature governs it apparently.

7699. Then, as regards your fourth point which you wish to bring forward—the cows and their offspring—what have you to tell us?—Some of these variations evidently have been arranged—Nature's arrangement, or whatever we like to call it. You take a couple of mild days in the month of February; that would seem as though milk should improve in quality, being warmer weather, and the cow is in the shade. But it does not do so, and the solids not fat get materially less. The reason is that where it is warmer the appetite is not so keen, and the milk is altogether poorer. The cow has drunk perhaps 10 to 15 per cent. more water that day than she drank the day previously, and that has told on the quality of her milk. That seems to be an arrangement for her calf, for which the milk was produced. The calf wants more liquid on that particular day. It seems a very natural arrangement. The milk was not made for man; the milk was made for the calf, and the cow or Nature seems to have made arrangements that it shall vary in this way. Take the question of food; high artificial food is not at all good for calves. If you want to find calf sickness, diarrhœa, and so on, go to the high feeders, and there you will invariably find it.

7700. What sort of cows are there generally prevailing in the districts which supply your dairy?—The whole of the districts?

7701. Yes?—Shorthorns mostly—they are practically the universal breed.

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7702. You do not get into the Hereford district?—Not much; men do not keep Herefords to send milk to London.

7703. Therefore, what you say about your experience would apply almost entirely to Shorthorns or a cross of Shorthorns?—Yes.

7704. Your fifth point is the main question I take it—the standard. What would you yourself recommend as a standard to be the standard of the country?—I do not think myself that I could recommend any standard. I am quite sure that the standard could not be the same for four months in the year as it was for the other eight to do justice to the farmer.

7705. Do you think to do justice to the farmer two standards would meet the case?—It would help to meet the case.

7706. And you would recommend that these particular months that you mention should be the time at which milk should not be expected to come up to a high standard?—I should certainly say that a lower standard should be taken during those months.

7707. What standard do you think that should be?—It should not exceed for those four months 2·75.

7708. In fat, and solids not fat?—Solids not fat 9 or nearly so. We are on the question of prosecution, and this view is different rather.

7709. The rest of the year you would be satisfied with a standard of what?—I did not say that I should be satisfied; I am not satisfied with any of those standards.

7710. Then what do you mean?—I say that a 3 per cent. standard of fat, taking it on the fat, would be a fair minimum standard for eight months.

7711. And total solids?—Notwithstanding the Yorkshire gentleman who was here this morning, the experience in the West of England amongst cheese makers is that the variation of solids not fat is less than the variation of fat—that is, presuming the cow is being fed fairly evenly.

7712. Would you put a minimum to that?—Nine per cent. of solids not fat is a high standard for many counties. In Somersetshire all round the Mendips, where the best Cheddar cheese is made, and where large quantities of Cheddar cheese are made, the solids not fat go up very high. The total solids of Somersetshire milk in the autumn is 13·5 for quite a common sample.

7713. What do you think would be a fair minimum for the farmer?—For eight months you might fix it at 9 per cent.

7714. You would go to 9?—Yes, for the best eight months.

7715. Do you think, if these standards were fixed by law, that fair justice would be done both to producer and retailer?—I say that that would be a standard which farmers could fairly work up to. That is on the question of justice as regards this Act; I do not know if that is what you are referring to?

7716. I was using your own words; you said "justice to the farmer"?—The question of justice with regard to this Act making a crime of what the cow does itself when nobody has manipulated the milk in any way. It appears to me not to be a question of justice at all when it becomes a crime.

7717. You know what the Act says?—I have read the Act; I cannot quote the words.

7718. You know that it is only to be a standard which should raise a presumption if the milk does not come up to it that it is not genuine unless the contrary is proved?—Yes.

7719. That is to say, that the man can avoid being held to be criminal by proving that the milk that he sent was really the milk from the cow?—I did not read the Act like that; I read the Act that if the analyst put in a sample which was below that particular standard, that that was a presumption that the milk has been tampered with.

7720. It would raise the presumption unless the contrary is proved—those are the words of the Act?—How are you to get a proof beyond that? The milk—that day's and that cow's milk—is all gone and done away with, and no other sample can be taken. It cannot be proved. That is the presumption in law; there is no other presumption. The milk has disappeared.

7721. Supposing it were possible that the cow was milked the next day, is not it likely to give pretty much the same results as the previous day?—It entirely relies on other considerations. It is not the fact. During the weak four months of the year there is a from day to day variation of a very large extent. I am speaking of ordinary farmers who have ordinary buildings to carry on their business in—not rich farmers.

7722. Do you think that a farmer's cows on Tuesday would not produce almost exactly the same class of milk as on Monday; I mean the herd?—The herd, of course.

7723. Of course, individual cows would vary?—I say not if the analyst always analyses the same; I say it points to quite a contrary thing altogether, and the milk they produce on Tuesday is not equal to the milk they produced on Monday, or vice versa.

7724. Of a herd?—Yes, we are speaking of herds.

7725. There is such a large variation in a herd?—There is a sufficient variation to make a half per cent. of fat. During last week at several times, different dairies, according to the analyst, show a difference of a half per cent. of fat—the same dairies, without any communication having passed.

7726. As much as that?—Yes, as much as that. I have been following out these things for the last month. Without any communication at all being sent to the farmer there has been a difference of a half per cent., and when we come to think of it the temperatures vary quite enough to make that difference at this season of the year. In October—to show the contrast—the milk comes of a very even quality, presuming there is food enough—extremely even. The nights in October are very much more even in temperature, and the fairly well-bred cow has a very ample natural clothing in October; in May she has practically none.

7727. Therefore you think that the farmer would not be able to produce proof to clear himself in the event of his milk not coming up to that particular standard owing to the variations there might be in his herd?—It is impossible to get the proof for that particular day.

7728. Then who is to be responsible? The cow cannot be made responsible. The farmer's milk has been sent away, the wholesale man has taken it up, and when the Inspector comes round and gets a sample below the standard who is to be responsible?—When it was only a matter of fining, a man might perhaps be reasonably punished for not farming sufficiently well to bring it up to the standard; but when he runs a risk of imprisonment on this presumption that the analyst is quite correct, I say that if it should ever be carried out it would be a question which would produce a great reaction against a high standard for milk. There would be the possibility of men who have never had any conviction of any kind being convicted and recorded in the police annals of the country. That would be manufacturing crime with a vengeance.

7729. In point of fact you think that we ought not to make any disturbance in the present state of affairs?—It is one of those difficult subjects that one can hardly pass an opinion upon. We are all anxious to have a high-class milk. If a wholesale man could get milk which always showed 3·5 per cent. of fat, I suppose nine-tenths of our troubles would cease. We keep striving for it, but it is impossible to get all of it up to that standard. I think very rightly the dairyman prefers to send out a high-class milk; I do not say there are not dairymen who habitually reduce the quality of milk, but in these days the men succeed best who send out the best milk.

7730. I believe a very good sample of milk is sent into London?—I should say very high-class samples of milk, even at this worst part of the year. As I said just now, 70 per cent. of the milk is of a thoroughly good high standard, both in fatty solids and in non-fatty solids.

7731. I thought you said 90 per cent. was?—70 per cent.; out of the other 30 per cent. I say that, although 20 per cent. of that 30 will show sometimes a good standard, on other days it is below the 3 per cent. standard of fat.

7732. I understand that 30 per cent. of your farmers during these months are what you call weak?—Yes, they are see-saw samples.

7733. Over this 30 per cent. there will be a see-saw, but ten per cent. every day are found wanting?—Ten per cent. out of this 30 per cent. that is 33 per cent. of the 30 per cent.; ten per cent. out of the whole is found wanting.

7734. Therefore 90 per cent. of the whole is good?—Yes.

7735. Therefore we really would have to deal more or less with ten per cent.; your experience shows that there

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is 10 per cent. which is weak, and liable to prosecution for it?—You would have to deal with 30 per cent. at this season of the year, because the 10 per cent. is here to-day and you have another batch of them to-morrow.

7736. But still on the whole supply given to your dairy on any one day 10 per cent. will only be under your particular average standard?—Yes, that is about it; on some days it is not that, and on some days it is over. That is only for the four months.

7737. If this milk goes out now the retailer is liable to be prosecuted under the present law?—Undoubtedly.

7738. But up to now no prosecutions, as far as you know, have taken place on this milk?—Not against us.

7739. And therefore if the standard which is supposed to be recognised now were made law matters would not be very far different to what they are now, so far as you are concerned?—I could not say; I think they are far different now.

7740. I say, supposing we put it at what they are now?—Under this Amending Act I think, as wholesale men, we stand in a far different position.

7741. In consequence of the passing of this Act?—In consequence of the passing of this Amending Act. We formerly were not vending milk to the public at all.

7742. You are the agents for passing it on to the retailers?—Yes.

7743. The collecting station, as it were, for a large district, which passes it on to the retailers?—Yes.

7744. How is your position altered by the passing of this present Act?—I think now, though it is not quite clear, that they can take samples and prosecute us right away. If we had a three per cent. standard they could prosecute us on ten cases every day for upwards of three months on an average.

7745. And they could not do it before?—No, we had not offered the milk to the public before. Of course, we should have to take care of ourselves by coming back on the farmer. We should have to arrange to have samples, and as soon as we found a farmer's milk coming weak we should have to take his samples to make it quite clear before it left his actual possession. It would be a very hard case for him. That quantity of milk cannot be done without; it is wanted, and this difference that we are speaking of is not a very serious matter. If you take the fat only the difference between 2·75 per cent. and 3 per cent. is only about the 48th part of the total solids in a gallon of milk; if you take a quart it is the 48th part of the 4d., which the public pays for it, and it is perfectly wholesome, and probably far more digestible than forced milks.

7746. Then you say you do not recommend any particular standard in your own mind if a standard were based on the figures you have given us, it would not work any injustice?—If this Committee would like to make themselves responsible for a standard, I think that would be a reasonable standard.

7747. (*Professor Thorpe.*) You say that in your contracts you specify 3·5 per cent. of fat?—Yes.

7748. I suppose you do that because you think it is a reasonable amount to ask for?—We think we ought to ask enough and get as much as we can; we are always striving.

7749. Still, I take it, as a reasonable man yourself, you are not going to ask for an unreasonable thing?—It is not unreasonable for eight months in the year to ask for that percentage.

7750. 3·5 per cent. for at least eight months in the year; will you tell the Committee as a business man what you do with a contract in which a man strikes out so vital a thing as the 3·5 per cent. that you are asking for; what do you do with the recalcitrant farmer?—"Milk as produced from the cow with all its cream."

7751. What is the value of this clause about the 3·5 if it is liable to be struck out, and you do not take any notice of the striking out?—We cannot help it. If we want the milk, and the farmer will not sign that clause, and we must have the milk as wholesale milk, at times we are bound to accept the farmer's statement that he will send it as his cows produce it. There is nothing dishonest about it in any way. The farmer is simply taking care of himself. To show how risky it is, I may mention that I met a farmer the other day who sends his milk to a very large distributing company in London, and he told me that there was a £100 fine if his milk was any day found below 3 per cent. of fat. That is a proof that that large company knows the real danger of having a standard of 3 per cent. of fat—a standard on which a criminal prosecution may take place where it falls below that standard. The man said, "I am never below it," but the man did not really know, and they do not know; most farmers think their milk the richest milk in the kingdom, but it is only the analyst that tells us the fact.

7752. You have made a point about the frightful penalties which, from your point of view, a milk vendor or milk producer is under. I think the risk of imprisonment was one of the things you mentioned. If you are familiar with the Act, you will remember that he has a considerable amount of licence and opportunity long before the pains and penalties of imprisonment are enforced. Is that not so?—That is so. But take my case. As I have already told you, there is 10 per cent. of the samples below that standard to-day probably. Mr. Inspector comes down, and he has a very big day with our firm. He gets ten samples to-day, and ten to-morrow. I do not know how long the magistrate is going to let me off, I am sure.

7753. We have had it in evidence constantly here that these exceptional cases can very largely be met by proper means and proper treatment, and it does seem to the Committee a somewhat unreasonable thing to ask that we must so fix a standard as to cover exceptional cases, which, in the main, can be met by very simple remedies?—Which, in the main, are met. We have no sample of milk that continually comes to hand under 2·75 of fat even at this season of the year. We should repudiate such a sample at once if it perpetually came like that. But these samples vary now, running over 30 per cent. of our total farmers. Perhaps these gentlemen have been able to suggest a remedy during these four months of the year, and have suggested in what way this can be easily avoided?

7754. (*Chairman.*) Seventy per cent. of your dairymen could show the other 30 per cent. what to do?—Yes; 70 per cent. of the dairymen are good, and are habitually good.

7755. Why are the 30 per cent. short?—Mainly because of the land. Whole districts at this season of the year come short. I had three farmers in one parish on Wednesday morning last below the 3 per cent. of fat. I looked up some analyses that we have, and I found that last autumn they were all three over 4 per cent. of fat. If they were clever rogues they would not have sent me the 4 per cent. of fat last autumn. Where you have 30 per cent. of farmers varying like that for three or four months of the year, I do not know how we are to find the remedy on large tracts of land which are perfection as far as water and health are concerned, and much safer as regards the health than those farms which are after the streams. These farms after the streams, where this rich land lies in many cases, as soon as the flush of water goes away, frequently in country districts are not very much better than open sewers. Ponds in fields are bad enough, but there is only animal excrement there; but these brooks running through these valleys in almost all the country districts receive human excrement. The sanitary matters in large villages are very badly done.

7756. (*Professor Thorpe.*) How does that affect the milk unless that water is put into the milk?—You must not take me out of my depth. I do not know whether you would really choose a milk because it was a rich pasture where a cow was drinking water of that kind. I cannot tell you how it gets into the milk, but scientific men say that it does.

7757. It does not get into the milk you may take it from me, because it is drunk in the water?—Do you really mean to say that all our trouble about seeing that the cows drink pure water is labour lost?

7758. Not at all, because the churns and the other utensils are all washed with that water; it is the common household supply, and the persons themselves are liable, of course, to suffer from such polluted water, and their excreta may get into the milk supply—that is the reason?—Not the cattle drinking it?

7759. Not merely the cattle drinking it?—Then there is very little risk, because even in these farms after the stream that is not the house supply of water; it is the supply for the cattle to drink, but I do not think any intelligent farmer to-day would drink the water out of the brook. On these richer lands after the streams there is no trouble with the percentage of fat; the trouble with the percentage of fat is on the poorer land, which is away from the streams where the cows and the land and the water are absolutely free from contamination.

7760. (*Chairman.*) Has contamination got anything to do with the question of fats and solids not fat?—It has only this to do with it, that the one is a perfectly wholesome honest milk, and probably as well adapted to the food of the people as the other.

7761. (*Major Craigie.*) You referred in your evidence to the variation in the four months of the spring as the period in which alone the difficulty arises?—Yes.

7762. Do you mean that these four months would be uniform throughout the country, or are you speaking merely of the conditions in the south of England?—They would be more or less uniform, but whether they would extend to the four months I could not say. In the more northern parts of our district we find the quality of the milk remain more even till a later period; the warm weather has not begun to affect the animal's appetite, I suppose.

7763. Do you attribute the difference mainly to the question of temperature more than any other cause in these months?—I could not say that.

7764. You could not?—Temperature is one of the influences, and it is a very important influence.

7765. I understood you to say also that the reason why a certain section of your farmers failed in these four months was due to temperature and to the character of the land?—Yes; that is, the character of the food.

7766. When you spoke of this particular 10 per cent. of dairymen who failed, and distinctly failed, in those months, were you thinking of the southern counties or of the eastern counties?—We do nothing in the eastern counties; we are dealing with the western, the north-western, and the south-western counties.

7767. Could you name some of the counties in which that particular poor land occurs?—Yes, there are large areas in Wiltshire.

7768. Would you say also Gloucestershire?—We should get some poor milk from parts of Gloucestershire from now for about three weeks. It is a cold neighbourhood, and one can easily understand that the same principles apply, as the food which is grown in these earlier weeks of the year has not got the fat in it.

7769. Would you include Berkshire or any parts of Berkshire?—I think it would apply there, but Berkshire is a fairly good county.

7770. Have you ever made any analysis giving the percentage of fat geographically according to the distance from which the milk came in those months?—We have frequently taken note that throughout the richer feeding districts—you may take the neighbourhood all round Castle Cary, Yeovil, Evercreech, up to Frome, leaving out one patch in between——.

7771. (*Chairman.*) Templecombe and round there?—All round Templecombe; there the solids in the autumn are extremely high, both the fatty solids and the non-fatty solids. The old-fashioned people knew where to settle down and make good cheese, and plenty of it; and throughout those old dairying neighbourhoods we find that the solids are very much better in every way. If you come up to a place called Witham Friary right away to Cranmore, and all through Wanstrow, and places like that, in the autumn it is exceedingly good, but at this season of the year if they did not artificially feed they could not get the milk up to the standard.

7772. (*Major Craigie.*) You have not said anything to his Lordship in your examination-in-chief on cream; have you had any experience in dealing with cream as distinct from milk?—We separate about ten churns a day, and we sell about forty quarts of cream to our customers.

7773. Do you sell a large quantity of cream?—No, that is a small quantity. Our sales, I think, before we were amalgamated were about seventy quarts a day; our average separating was about forty quarts a day, and we bought the other.

7774. Have you any views upon the subject of a standard for cream which comes within the scope of reference to this Committee?—Do you mean as to the percentage of butter fat in cream?

7775. Yes; can you suggest anything as regards that?—As far as ever I have known when I have tested it there has been quite a pound and a half of butter to a quart of cream. Then we have always made a special point of the little drop of cream that we sell; we do not make a point of selling cream, and we do not push the cream trade in any possible way; the retail dairymen we have often thought do not care to deal with men who sell large quantities of cream.

7776. You do not sell the cream in jars or clotted cream?—No.

7777. Do you purchase any cream by itself as apart from the milk?—Yes, we purchase considerable quantities in the cream season.

7778. What part of the country does it come from chiefly?—We have some from Wiltshire and we have some from Edwards and Co., which comes out of the Midlands more especially—out of Buckinghamshire particularly.

7779. Do you ask for that to be brought up to any particular standard in your contracts?—No; we judge of the standard by its consistency and general appearance.

7780. You do not say the percentage of fat?—It has always been a very high percentage when we have taken it.

7781. Are there more grades than one of cream sold—is it sold at different prices according to its thickness?—Yes, it is known in the trade as double cream and single cream.

7782. Could you suggest a standard, say, for single cream and double cream separately?—I could not suggest a standard for single cream, but double cream should have a pound and a-half of butter fat in a quart of cream.

7783. Have you any experience in dealing with condensed milk?—No.

7784. (*Mr. Cowan.*) Have you farmed land yourself in your time?—I was born and bred a farmer, and farmed myself for seven years.

7785. Had you a dairy at that time?—I had.

7786. Did you make cheese or sell your milk?—I made cheese always.

7787. You would analyse your milk occasionally during that time?—When we were cheese-making?

7788. Yes?—No; but we could tell how many gallons of milk we had and how many pounds of cheese we made, which is the practical outcome.

7789. During the time you were farming yourself did you ever find any difficulty in your herd in getting 3 per cent. of butter fat?—Being cheese-makers I could not say, but I know once when I was in Worcestershire farming on the sides of the Cotswolds we had in the cheese tub all told nothing like 11 per cent. of total solids. It was a very cold time.

7790. Did you not sell milk in those days?—No, I never sold a gallon of milk in those days.

7791. You recommend a standard of 2·75 in four months of the year; I have got down March, April, and May—is the fourth month February or June?—Those three months are quite correct; it evidently varies very considerably. I saw a chart drawn by the Aylesbury Dairy Company not so long since, and with the exception of about one year there is always a lowering of the quality of the milk, and it comes at that period, sometimes later, sometimes earlier, but it is there.

7792. You think it falls below 3 per cent. during those months in a great many cases?—Yes, in a considerable number of cases.

7793. Ten per cent.?—Yes.

7794. Have you any reason to suppose that the milk sent in by those 10 per cent. or by the 30 was adulterated?—Not 30 per cent.—I should not suspect 30 per cent.

7795. Then the 10 per cent.?—They are not always the same 10 per cent.

7796. Do you make it out that it was owing to the cows giving an inferior quality of milk in those months, or may it not have been that some of those milks were adulterated?—Of course, it may have been; we will not judge of a man's general character. As I said just now, three cases I had last week were suspiciously poor; I looked up the analyses during last year, and we found that during certain months of the year they were particularly good.

7797. That would make it out that it was not the fault of the cow, but that it was the fault of the owner of the cow in giving you some of that milk bad?—I should say quite the contrary.

7798. Would you make it the fault of the cow?—Yes.

7799. It may have been through inferior feeding on those particular farms, but you get 90 per cent. of your supplies, you say, to give you a very rich milk, while the 10 per cent. give you a low one—that might have been caused by inferior feeding during those months?—Yes.

7800. As a farmer you would, of course, know that?—Yes, it may have been caused so.

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7801. Then we must not put that to the disadvantage of the cow. Again, it may have been another way, may it not—through the irregularity of the calving of those cows? If those 10 per cent. were sending in a lower quality of milk in those months that you speak of—March, April, and May—I would suggest that they would be in the position that I am in myself, or you were at one time, namely, that those were cheese-makers, and that the bulk of their cows are calving then. Do those men give you a regular supply through the season, or do they go off at this season of the year?—They give a fairly regular supply throughout the year.

7802. Then they do not make cheese at all?—They do not.

7803. Then that will not account for it. In speaking about feeding you held that feeding does not improve the quality to any appreciable extent above its normal quality, I think?—I have never said so, and I should be sorry to say so. Feeding is the one thing that does improve the quality.

7804. (*Chairman.*) You are the first witness who has told us that?—But you cannot always get the cow to feed—that is, to eat sufficiently of these hard foods.

7805. (*Mr. Cowan.*) I quite agree with you. I have found myself that you cannot get cows to take bean meal, say, when they go out to the pasture; that is the difficulty?—Yes, a difficulty arises there.

7806. Would it not be a great encouragement to the enterprising farmer to produce a high-class milk if there was a fair standard fixed?—I find honest men now produce a high standard of milk where their land and buildings allow them to do so.

7807. Would there be any difficulty if there was a fairly high standard fixed with those men that are sometimes deficient with you in coming up to that standard?—Yes, the greatest difficulty.

7808. For what reason?—Because the quality of the food they grow on the farm is so much inferior to that growing on richer land.

7809. I do not think that follows. It has been given in evidence before us that on a poorer class of land the cows give an equal quantity of butter fat to that produced on other land?—When I say that I say it in a general sense. I know myself some land which is very poor which gives better butter fat in the summer months than land which is much richer.

7810. Does it not depend a great deal on the breed of the cows that you have on that land?—It naturally would depend somewhat on the breed, and even more on the selection of animals of any one particular breed.

7811. Then do you not think that the farmers should accommodate themselves to the character of the land they have in putting on a stock which it can carry properly?—Yes; but if a tenant farmer has to pay his landlord so much rent, and it costs him a penny a gallon more to produce milk at this high standard, he cannot do it on these poor parts—that is, he cannot practically do it. Of course, it can be done—there are many things which can be done, but we are looking at this matter as a practical food question of the people.

7812. Yes, but should not everything be done that would tend to be an advantage to the great consuming class?—Yes; I say this is a splendid article of food, but it is only a forty-eighth part less than the standard that has been named here to be fixed.

7813. Then you spoke of your responsibility; I understand you are entirely in the wholesale business?—Yes.

7814. Then you can have no responsibility, can you, if there is a fair standard fixed? You seem to be afraid of the responsibility—where does your responsibility come?—The responsibility comes in under this Amended Act. I am not afraid of the responsibility, but it can hardly be the ambition of any intelligent man to run the risk of being a guest of Her Majesty.

7815. There is a great deal to come and go before you would be the guest of Her Majesty; you would never be there unless you thoroughly deserved it, I think?—I must differ with you. I think sometimes a magistrate's liver has something to do with it.

7816. So far as your position as a wholesale dealer is concerned you have no occasion to fear responsibility supposing there is a fairly high standard fixed?—Not when I tell you that there is an average of 10 per cent. every day for three months below the standard?

7817. But then you told us afterwards that you would at once fall back on the producer—that you would shift the responsibility on to his shoulders?—As far as I understand the Act we are all responsible—the producer, the wholesale man, and the retailer under this Act.

7818. Yes; but you would throw your responsibility at once on to the back of the producer, would you not?—We should try to prove our innocence, but that would not prevent us being punished for the crime of selling it.

7819. It would be the farmer that would be punished, and not you?—Under the Act I think we can all be punished all the way through.

7820. You can only be punished if you make any addition to the milk after you get it, and then you would deserve it?—Of course we should.

7821. (*Mr. Barham.*) I take it that the whole of your life has been passed in connection with dairying and dairy farming?—Yes, from my boyhood; I was born in it.

7822. You were a dairy farmer for how many years did you tell us?—I was with my father till I was twenty-five years of age, and I was farming a dairy farm on my own account for seven years; then I embarked in the wholesale milk trade in London.

7823. And you have been in that trade about twenty years perhaps?—I have been in the trade now for twenty-three or twenty-four years.

7824. I think the company you represent here is the second largest wholesale firm in the kingdom?—It is a large company; I should say it is something like that.

7825. There may be one other larger?—Yes.

7826. But there are not many larger?—There are not.

7827. So that your experience is about as wide as we should find in connection with the wholesale trade anywhere in the United Kingdom?—I cannot imagine anyone having a wider experience except one gentleman who sits on this Committee, who has bought milk all over England, where I have only bought in one large section of the country.

7828. In regard to what you spoke of as to the 30 per cent. of the farms sending occasionally poor milk during the months that you have mentioned, would that partly arise or wholly arise perhaps from those farms being unusually exposed? I mean they may have a northern or an eastern aspect. I have a farm in my mind now where the whole of the land falls to the east and to the north, and, of course, is more liable and more exposed to cold winds than what one's neighbours would be on the other side of the hill?—Undoubtedly this question of temperature has a great deal to do with it, but not all to do with it. In these cases that you have named it is probably the predisposing cause of poor milk.

7829. Is it possible for you to protect yourself and your clients by testing the whole of the milk that arrives for butter fat before it is sent out and offered to the public?—Utterly impossible.

7830. Therefore you are bound to sell the milk on the faith that it contains the quantity that Government or some other authority may ask of butter fat and non-fatty solids?—It is an absolute necessity of the trade.

7831. You have some experience among your customers of milk being bought for analysis under the preceding Act, of course; I do not know whether you are aware that under the new Act there must be fourteen days' notice between the service of the summons and the hearing of the case?—I know there is a provision of that kind, but I do not remember the exact time.

7832. So that even if action were taken by the local authority within a week of the purchase and the analysis, a fortnight must elapse before the hearing of the case, and that will be three weeks, I take it, before an appeal could be made to the cow?—Yes.

7833. It has been suggested here that an appeal might be made the next day; do you think that is practical?—Quite impracticable and absolutely useless when done.

7834. I am speaking about its practicability now for the moment?—Very impracticable.

7835. You see, the inspector would buy a sample to-day; in all probability it would not reach the analyst until to-morrow; the analyst would take at least twenty-four hours to deal with it, hence we have got two days; a Sunday intervening would make three days before it could be known whether the milk was even doubtful or not?—Precisely.

7836. With regard to the duplicate samples that were thought to be doubtful, in order to refer to the cows within twenty-four hours it would mean that whenever an inspector took a sample in a town he must at once go

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to the railway station and take the next train in order to get to the farm in time to get a sample there to compare with the one he has purchased in London, and that is impracticable?—Yes.

7837. I think the Act says that anyone guilty for a second time of selling what is called adulterated milk—that is to say, milk that is deficient in any of its solids—is to be liable on the second offence to a certain term of imprisonment?—Yes.

7838. The gentlemen around this table have thought really it is a good joke for any man to have three months' hard labour; you would be so many years in attaining to it, and it would be so unlikely that you would very seldom have the pleasure of being the guest of Her Majesty in the manner to which you referred; but it seems to me that with 10 per cent. of your milk coming below a standard of 3 per cent., supposing that standard were fixed here, in twenty-four hours you personally would qualify for that position?—That is so.

7839. (*Professor Thorpe.*) It has to be proved to the satisfaction of the Court that certain things have been done before imprisonment is ever dreamt of; it is not the offence merely which leads to the imprisonment, it is certain other facts of which the Court has to be perfectly certain before imprisonment is inflicted, otherwise it becomes a mere fine?—I understand the proof under this Act is the analyst's certificate; it does not suggest anything different to that.

7840. Pardon me, that is not the proof which will satisfy the Court as to whether imprisonment should follow. The analyst's certificate is the thing upon which proceedings are taken, which may result either in fine or in imprisonment; that is the point. But whether imprisonment shall result does not at all depend upon the analyst's certificate, that depends upon certain collateral things which are brought in, namely, the personal act of the defendant, default or culpable negligence; the analyst has nothing to do with those things?—But does it not amount to culpable negligence that I had ten samples of milk wrong last week; I have ten again wrong this week—not the same ten, but another ten—and I have ten next week; is that not culpable negligence under the Act?

7841. (*Chairman.*) The Court would have to decide that?—Is it not likely that, seeing the Act is formed to sell milk up to a certain standard, thirty cases in three weeks would be sufficient to prove culpable negligence?

7842. (*Professor Thorpe.*) It is perfectly open to you—supposing you are the person to answer this—to point out that this is the month of May, or this is the month of April, whichever is the month in which these things take place, and therefore to excuse yourself from the charge of culpable negligence; that is quite obvious?—It may be so; but that is not the way I have read the Act, and that is not the way I have been advised that the Act would be carried out.

7843. Nothing has been decided on the section yet, therefore we cannot anticipate that?—As a case of principle, is it not a case of manufacturing crime under these circumstances?

7844. (*Chairman.*) We have not got to settle that?—No, but that has a bearing on the point.

7845. You and I are both liable, we are both in the same business?—Yes.

7846. I have got to defend my own skin as well as yours?—All that I can say is that Mr. Barham and I will be in very good company.

7847. (*Mr. Barham.*) Dropping the new Act for a moment and referring to the old one, does it not say there that the penalties are for those who should knowingly and fraudulently sell adulterated milk?—I do not quite remember; there are some qualifying words I know.

7848. Whether a dairyman knows or not that the milk is adulterated the magistrates at the present time always hold that he either did know it or should have known it?—That is so.

7849. And he is punished accordingly?—Always.

7850. I think we may assume that that would be the course adopted under the new Act?—Yes, especially as it is only an amending Act.

7851. I think you have said that 3 per cent. of butter fat would be a reasonable standard during eight months of the year?—Yes.

7852. (*Mr. Farmer.*) You said, I think, that when the cows were in shed warm weather reduced the butter fat?—I did not say it reduced the butter fat. It may happen that the butter fat with regard to the bulk might be reduced; but it will reduce the total solids of the milk.

7853. That is when they are in the sheds?—Yes, even in the sheds.

7854. But when they are out in the open it is the cold weather which reduces it?—It is the cold weather which reduces the fat then.

7855. When they are in the open it is cold weather that reduces the fat, and when they are in the sheds it is warm weather that reduces the total solids, is that it?—It does not do so invariably, but it will do so. The cow drinks more water on those two or three warm days and eats less food; the quantity of milk given is more. It is somewhat difficult to get at because the quantity of milk given in winter on mild and cold days shows a very material difference. The extra quantity is mostly additional water.

7856. You have told us that some of your customers have been prosecuted for inferior milk?—Yes.

7857. But that you are not able in any way to trace that milk to show that you had sent it to them?—We were not able to say what was the quality of the milk when we sent it to them. That particular consignment of milk had not been analysed on that particular day.

7858. I thought I understood you to say that you could not trace the milk at all?—The milk that they used was the milk we sent them. We had lost touch with the milk, and we had not analysed the milk before it was sent.

7859. You do not mean to say you could not trace what farm it came from?—No; we could frequently trace the farm, but not always—especially in the winter time.

7860. You cannot always trace it?—No.

7861. I gather from the observations you have made before—I possibly misunderstood you—that it was a difficulty, that you very seldom could trace it?—We can sometimes trace the particular farm, and sometimes not, but we have never in any one case that I remember been able to say that the milk was adulterated when we sent it away from Paddington Station.

7862. This is what I was leading up to. I was going to ask whether under those circumstances it was possible to plead the warranty given by the farmer?—I believe that has been done under the old Act—and successfully done.

7863. It would be rather difficult if you could not trace it to the farmer, would it not?—Yes. That defence has been given and upheld; it has been held to be good.

7864. (*Mr. Murphy.*) Do you very frequently analyse your milk?—Yes; we pay an analyst an annual sum and large sums in addition.

7865. Can you tell me whether the milk which is found to be adulterated in London is in large degree milk that is supplied to the poor?—I could not say; I have no means of knowing where the greater number of adulterated samples come from.

7866. You do not come in direct contact yourself with the consumer?—No.

7867. But with the retailer?—Yes.

7868. So you have no personal information as to whether the milk to which the sanitary authorities have taken exception is milk that has been purchased from the tradesman supplying the poorer people in London or from the tradesmen supplying the richer classes?—We have no means of knowing.

7869. (*Chairman.*) Do you get your milk morning and evening?—Yes.

7870. Do you think there would be any difficulty in the whole of the milk of the country being sent up once a day?—Yes. I may explain that during the winter months we have a certain portion sent up once a day.

7871. Have you found the milk so sent sweet, or are there difficulties about it in consequence?—In the cold weather it is perfectly sweet.

7872. Would there be any difficulty in your own mind if the milk was treated throughout the country once a day instead of twice?—Yes, the greatest difficulty.

7873. That is your opinion?—Yes. There are but few men who can do that. We have a few men who do that, and we allow them to do it, but they are extremely few.

7874. I understand that in Manchester there is a company which undertakes the supply of the best milk which

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is going to be treated in that way, and that they find no difficulty?—I understand there is a system of preserving milk now.

7875. Without preservatives at all?—The temperature must be different in the North to ours here if they can do so successfully.

7876. (*Professor Thorpe.*) Have you studied at all or are you aware of the methods of the supply of milk in Continental cities?—I have been told that in Denmark they always supply it once daily; in fact, not so often as that, but that it all undergoes a system of preservation.

7877. In Copenhagen there is only one supply of milk per day, and a fairly large proportion of the milk is not pasteurised or in any way treated; are you aware of that?—I think that the temperature of Copenhagen would be very much lower than the temperature of London.

7878. Are you aware that the temperature of Copenhagen in the summer is very much higher than that of London?—No; and if it was, unless the milk was treated, I should very much doubt their being able to serve them with sweet milk.

7879. That, in fact, the milk is not treated, and that the average temperature of Copenhagen in the summer is very considerably in excess of the temperature of London?—Then all I can say is that Copenhagen milk must keep very much better than will Wiltshire milk.

7880. (*Chairman.*) I suppose if it were possible to get the milk of the country sent up once a day instead of twice the standard could be raised to a certain amount without any difficulty, because the morning and evening milk being mixed together the average necessarily would be somewhat higher?—Supposing the difference between the morning and the evening milk were a half per cent. when that was mixed, it would only be a quarter per cent. difference, would it?

7881. Taking the two as one, you mean?—Yes.

7882. But still it would make a difference?—It would make a slight difference.

7883. I suppose your suggested standard of 2·75 is meant to meet the morning's milk?—To meet the lowest case.

7884. I presume the 30 per cent. you have spoken of are constant: they would be the same farmers, would they not?—Yes, that is the idea that I wish to give you, namely, that out of between 400 and 500 farmers there are so many who at this season of the year—and especially at this particular season where we are now just in April and the first two or three weeks of May—that any one of those 30 per cent. might be below the 3 per cent. standard of fat, and possibly of a 9 per cent. standard of solids not fat.

7885. Have you ever remonstrated with these men?—We invariably write to them when they get below the 3 per cent. standard.

7886. Do you threaten them at all if they do not alter it?—No, I point out to them the new Act, and they know the difficulty they are under.

7887. Have they not changed or altered it?—They do alter, and go backwards and forwards again. They write and say the milk has not been tampered with—and in many cases neither has it.

7888. We had a witness yesterday who is in a very large way of business, and he said whenever he remonstrated with his suppliers an alteration very soon takes place?—But in the winter if we get a low sample of milk in these doubtful months we insist upon their feeding higher, and we get a better sample of milk in consequence; but during a part of March and April and the early days of May the mere fact of our insisting upon their feeding better does not necessarily produce better milk. Take a case of feeding with mangolds or beet; there are plenty of soils in this country which will grow a good sound beet, and the animals when they get accustomed to that will eat large quantities; during this milder weather they will eat these succulent roots and leave the dry food, with the result that although the milk will show a percentage of fat over 3, the analyst will return the sample as having added water to the extent of 4 or 5 per cent.

7889. Do you know from your experience whether it is the custom of the magistrates usually to convict on such a small percentage as 4 or 5 per cent?—Yes.

7890. (*Professor Thorpe.*) With a relatively higher percentage of butter fat in it?—Sometimes, as I indicated just now, the magistrate is in a happy frame of mind and a man gets off; another time, with the same percentage of fat, he gets punished. Nobody can deny it, there is the record.

7891. (*Mr. Barham.*) You have been asked about Copenhagen; you have been told that milk is sold there once a day; you have also been told that it is a very hot place in the summer; no doubt that is so, but it is a very cold place in the winter, is it not—is that within your knowledge?—I should say so, judging from the latitude.

7892. It is a very cold place?—Yes.

7893. Is it further within your knowledge that there is a very great deal of ice there for six months of the year?—Yes, and it can be had for an extremely small cost.

7894. At the cost at which it can be carted from the lakes and streams and so on, which are very numerous?—Yes.

7895. Is it within your knowledge that nearly every farm in Denmark has a plentiful supply of ice?—I understand that it is a common article in every house.

7896. And that dairy people near Copenhagen can purchase the ice for a very trifling amount?—Yes, for the cost of the carriage.

7897. In fact, the milk which is kept for the second meal is kept in what might almost be termed, if Professor Thorpe will forgive me saying so, melted ice; it is kept for twelve hours in what is practically melted ice—that is to say, it is in water of about the temperature of 34 or 35 degrees for about twelve hours till the next meal is ready?—Yes.

7898. Is such a course as that practicable or possible here?—Certainly not at the present moment.

7899. Do you know anything about the Paris supply?—Not practically. I have been told that they preserved formerly by scalding, but that they do it now by pasteurising.

7900. That is to say, the two meals are mixed together, the one meal is boiled and the other meal is sold fresh?—Yes.

7901. Do you think the London people would buy a milk a portion of which had been boiled, and must therefore have acquired the boiled taste and flavour?—I am quite sure the public taste in London would not admit anything of the kind.

7902. (*Professor Thorpe.*) Upon this question permit me to read you this: "The Manchester Milk Supply Association has established their concern to supply milk to Manchester once a day. They find no trouble in doing this. The milk keeps perfectly well. Customers were at first somewhat disinclined to believe that milk possibly could keep sweet from one morning to the next, but their prejudice once overcome they now find that the system saves trouble. The company does this by dealing with careful farmers, who in winter collect and store ice and snow, or are supplied with artificial ice by the company. The net result is, without enhancing the retail price, the public get better, safer, and purer milk, the farmer gets a higher price, while the company recoups itself by economising the cost of distribution, and it will be possible to reduce the present price of 3½d. a quart to 3d." You are not aware of that?—Why do they get a better result?

7903. Were you aware of the fact that they are doing it in Manchester?—No, I was not. How long have they been established? How long have they been doing that?

7904. I am not in a position to tell you how long they have been doing it, but they have been doing it?—That is easily done for eight months of the year.

7905. But for all the year round, you think this is impracticable?—I do.

Mr. G. Adams.

Mr. GEORGE ADAMS, called; and Examined.

7906. (*Chairman.*) You are a farmer in Berkshire, in a large way of business?—Yes.

7907. You farm as much as 4,000 acres, I believe?—I do.

7908. And you have in your dairy herd 500 cows?—Yes, I have.

7909. I understand that you send from forty to fifty churns of milk every day to London?—I do.

7910. Have you experienced any difficulty in the conduct of your business with regard to the quality of the milk which you send up?—About twice I have, once when I was using straw chaff, being very short of hay

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indeed, and gave mangold. We got the milk rather poorer then. I looked into it, and we altered the food, and we very soon put it right. The other time was in 1879, when we had a very wet year.

7911. We all remember that year?—It rained so that the meadows all got flooded, and the grass was very plentiful, and the milk got very poor indeed. Those are the only two occasions that I ever recollect having had any trouble.

7912. What do you think yourself the standard of milk should be in the country?—I heard what Mr. Hoddinott said, but I should think if it was three per cent. for March, April, May, and June, it might go to 3·25 for the other eight months.

7913. You put your standard higher than his?—I should rather.

7914. You are speaking as a producer, and he as a distributor?—Yes.

7915. But do you think you would have no difficulty as a farmer in getting on your farm three per cent. of butter-fat during those months?—I do not think so.

7916. And 3·25 in the other eight months?—I think that would be very fair.

7917. Have you had an opportunity of consulting other farmers in your district about this subject?—Yes. All the best men, and those that feed well, with us, I know have had no trouble.

7918. Would they be of the same opinion as yourself?—I think they would.

7919. That the standard of butter-fat should be three per cent. as you say in those months, and 3·25 in the others?—Yes.

7920. Have you anything to say in regard to the solids not fat?—I think we might take for the four months 9 per cent. of non-fatty solids and 9·25 per cent. for the other eight months.

7921. Is yours what is called a good dairy district; have you good grass?—Ours is a very good dairy land.

7922. Have you any experience of what we have heard spoken of here as bad lands for dairy farming?—Yes. I know there is some land that will produce much poorer milk than other lands, and some land that will produce much richer milk.

7923. Do you think there is any land which would not be able to come up to the standard you propose in any part of the country?—I do not think there is.

7924. Even on what is called bad land?—I do not think there is.

7925. I understand that you would like to see some measures adopted for the selling of separated milk in marked cans?—I think that is a great point that we farmers want. I don't doubt for a minute that there is a great deal of separated milk used in many places.

7926. I have no doubt it would be a good thing to mark the cans, and I may tell you that several other witnesses have said the same thing to us?—I think there is a great deal of separated milk mixed with rich cream—that where rich milk is sent it is greatly reduced by adding separated milk to it. I would strongly recommend where separated milk is allowed to come to London that the churn should be marked with one inch letters, "separated milk," so that it can be seen at once who is dealing in separated milk.

7927. (*Mr. Barham.*) Why not paint the whole churn red?—I should say a red churn would be a good thing. I think it is a very great point to supply the lower districts of London with a better article. We should raise the price of milk, and we should get a better article altogether on the market. I know very often that my milk would stand separated milk being added to it if I thought proper to put it in; but I have not got a separator, and I do not intend to have one. I am as certain as I sit here that it would improve the quality of milk in London a great deal if there was something done to let you know who sends separated milk here, and who does not. They ought to be punished very strongly who do send it.

7928. (*Chairman.*) Would the churns that you refer to be the churns on the railway?—Yes.

7929. (*Professor Thorpe.*) I think you heard Mr. Hoddinott's evidence?—I did.

7930. Did you agree with it?—With a good deal of it I did thoroughly.

7931. What did you not agree with?—I am rather different on the point whether the feeding of the cattle makes good milk—whether the feeding has got to do with the quality of the milk. Again, in regard to what causes poor milk in March, April, May, and June; nearly all the cows are calved then, and they are just fresh; but in July, August, September, October, and November we have cows staler in the milking period, and they give richer milk.

7932. The point of that is that if there were a more equable distribution of the periods of calving, the difficulties of even those four months would be largely obviated?—They would very much so. There is one more point I wish to suggest to the Committee, if they could deal with it. All samples of milk should be taken at the station where we put it on—not at Paddington, because the milk coming up to Paddington, and reaching there at ten o'clock in the evening, is very often allowed to stand there till three or four o'clock the next morning, and I know it gets tampered with a good deal there.

7933. (*Chairman.*) To whom would it belong, if you parted with it at your station?—I take it that when we have put it once on the line it belongs to the people we have sent it to.

7934. They say not; we are told here that they do not consider it is theirs until it is delivered at their receiving station?—I never had a complaint, but it is very easy for an innocent man to be prosecuted and fined. We put it on at Faringdon, and there is a branch to Uffington, and it goes out there. Not long ago a man was locked up for stealing a pair of gloves and a spirit flask. When they searched his lodgings they found a lot of empty whiskey bottles and cases, and the man admitted taking my milk and this other party's whiskey to a very large extent, and said that he actually put water back into the churns.

7935. Is that long ago?—About six months ago. It happened at Uffington station. The man, I think, got six months' imprisonment.

7936. Were the churns locked or sealed?—You cannot do any good by locking them.

7937. But you can seal them?—Still they can take the milk out, and put the water in.

7938. Not with a sealed can, can they?—I think so with nearly every one of them; there is one lid might keep it out. They can always get the milk out no matter what we do to it. They can easily do it, and with fifty churns out of fifty-one they can put the water back again.

7939. That is rather a question of mechanism, is it not; the trade ought to be able to provide cans which could not be tampered with?—I think Mr. Barham knows that what I say is right.

7940. We cannot fix a standard to meet these things?—No.

7941. Who is to be the responsible person if you part with it at your station; is it to be the man you send it to in London?—The man we send it to, I think. I applied myself for a special carriage each morning, so that we could lock it at Faringdon, and our people could unlock it up here in London, but the Great Western Company would not give us any help whatever in that way. It really wants something.

7942. (*Mr. Farmer.*) If you made him pay the carriage, then he would be legally responsible from the time you delivered it?—He would.

7943. But inasmuch as you pay the carriage?—You know the farmer is the weakest of the two.

7944. (*Major Craigie.*) You have told us that you farm four thousand acres, and milk five hundred cows on the average?—Yes.

7945. Can you give us any description of the breed of the cows?—Good milking Shorthorns is what I like better than anything else.

7446. Do you keep very much to the same class?—Very much so.

7947. Have you no difficulty in keeping up the yield of your milk with the same class of cow?—No, we have not.

7948. Have you kept any records of the average quantities as well as of the quality?—No, I have not; it would involve a lot of work.

7949. Do you sell your milk all by contract?—Yes, all.

7950. Do you sell any cream as distinct from milk?—I do not sell any cream.

7951. (*Professor Thorpe.*) In your contract, is there

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any specification as to the amount of butter-fat?—There is.

7952. What does the contract specify?—3·25.

7953. Do you occasionally strike that out, as you have heard Mr. Hoddinott say his people do?—No, I deal with good firms always, and I take it with what there is on it.

7954. You do not feel it a hardship to be asked to supply that 3·25 per cent. of fat; and you are able to comply with that?—Yes. We have never had any trouble yet. But I really think that for the four months I have named, it ought not to be higher than 3 per cent, if you are going to fix a standard.

7955. (*Chairman.*) I understand you say that is in consequence of your cows calving then?—Yes.

7956. Could you not alter that if you wished?—It would be a great trouble. It is a good time of the year for the cows to calve. If you get them calving during the hot weather in the summer, you would lose a good few by milk fever. It suits the trade better. They want more milk in May and June I suppose in London than at any other time of the year, and that is why we calve them down at that time.

7957. (*Major Craigie.*) Have you any difficulty about the hours of milking; what is the difference of time between the two meals of the day?—We like to milk them before six o'clock, and after three o'clock; that is our time of milking.

7958. Have you found much difference between the quality of the morning and of the evening milk?—Not very much.

7959. (*Chairman.*) Do you mean that you finish milking before six o'clock?—Yes.

7960. And begin again after three?—Yes.

7961. So there would be an interval of ten hours about?—Yes. We like to keep them as regularly as we can.

7962. (*Major Craigie.*) Your interval is rather different to some of those we have heard of—eight and sixteen hours?—That is too much.

7963. Would you anticipate that if there was an interval of sixteen hours, you might have a great reduction of fat in one of the meals?—Yes.

7964. I think you are distinctly of opinion that there ought to be not one standard for the whole year, but a variable standard for different parts of the year?—I am sure of it.

7965. That is the result of your experience?—Yes.

7966. Could that be worked?—I think it could.

7967. You do not think the dates would differ for different parts of the country, do you?—No, I think not; I think it would be the same all through the country.

7968. Do you propose to suggest 3 per cent. of fat, and 9 per cent. of non-fatty solids, or a total of 12; would you like to have a total of solids of all kinds, fat and non-fat, or would you separate the two, and require both the 3 per cent. and the 9 per cent.?—I should want the 9 per cent.

7969. Would you take them separately?—Yes.

7970. Would you rather have that than a total of 12 per cent. of all solids?—I would.

7971. In the same way for the eight months rather than have simply 12·50 of total solids, you would have 3·25 of fat, and 9·25 of solids not fat?—Yes.

7972. (*Mr. Cowan.*) Do you sell the whole of your milk?—I do.

7973. Do you not make either cheese or butter?—We make, say six pounds a week, and then we give the milk to the calves as we wean them.

7974. In selling your milk, throughout the whole season, do you not think you would avoid any necessity for lowering the standard in those months that you speak of, if you allowed your cows to be calving regularly throughout the twelve months?—I think then it ought to be lowered. I think the food is poorer, and the cow is giving more; then when you turn them out to grass they flush their milk, and you would not get it rich enough. I think it would be far better to have two standards.

7975. Do you think there would be no difficulty even in those months of getting 3 per cent. of fat and 9 per cent. of non-fatty solids?—I think we could do that.

7976. Why do you advocate two standards?—Because the milk is not so rich at that time of the year. It would cause us to feed a great deal richer, and a great deal better food, and more costly food, if we did not have two standards.

7977. Even as you are feeding you say you yourself get to the 3 per cent. and the 9 per cent. in the months of March, April, May, and June?—Yes.

7978. Why should you say that just on the last day in June the cows should run up a quarter per cent. more then?—They would have got more used to their new keep, and the bulk of the grass would be got over a little.

7979. Why should they come down to 3 per cent. just on a special day, on the 1st of March?—You might say the middle of February or the middle of July; that is as I take it.

7980. It would make it very awkward, would it not, just reducing the standard at a given time over the whole country?—I expect that would lower itself and raise itself a little before and a little after.

7981. You sell at a standard of 3·25?—That is what my contract is.

7982. Do you get a premium if you supply milk over 3·25?—We do not.

7983. And you are not fined if you supply under?—If we are not up to the standard, I should expect a letter very quickly from them.

7984. You get no benefit by giving your purchaser a milk up to 4 per cent.?—No, we do not. It will go up to 4 in October and November.

7985. You do not sell by quality altogether then—you sell on a certain quality, but you are not paid as by quality, are you?—We are not, as long as we send that quality—as long as we send the 3·25.

7986. In speaking about responsibility, I think you hold very strongly that the responsiblity of the producers should cease at the station?—I think so myself.

7987. May I ask if it is the station you send it from or the station where you deliver it to that you have in mind?—The station that we send it from.

7988. You bind yourself, you see, to deliver it to the purchaser?—We do.

7989. Then, in that case it is certainly under your care until it reaches the purchaser?—We stand very much to be shot at for what is going on after we have done with it.

7990. If you get rid of your responsibility after it reaches the purchaser, do you not think it is quite proper—indeed, that you should be responsible till that time, and do you not also think it is quite possible to avoid any risk of adulteration from the time it leaves you till it gets to the station of delivery?—Yes, if we could get the railway companies to lock the carriages.

7991. By locking the carriages, you say?—Yes.

7992. Would not locking the churns do just as well, or sealing the churns?—I do not think it would; they can still take the milk out and put the water in.

7993. Not if they have a close cover?—They can always take it out. No one can stop them taking it out. They might be stopped from putting anything in.

7995. They may take cream off the top and put water in?—Yes; I would not mind if they took a churn of milk. I have known a churn of milk taken away from Paddington station continually, and the day they take the second churn they would bring the empty churn back. There is nothing to stop them bringing a churn of adulterated milk and putting it down in Paddington Station, and taking a good one away, and anyone might get convicted on that. There is a great deal of roguery going on at the stations.

7996. As a producer, you would be quite satisfied if your responsibility ceased at the station of delivery?—Yes, I would.

7997. Would you also be satisfied if the railway companies allowed you to lock your churn or gave you a special railway carriage?—That is what we want. We want to see the carriages locked.

7998. Have you any difficulty in getting milkers in your part of the country?—We have. They are wanting more money a good bit, and they are getting very scarce.

7999. I suppose they are scarce, and want more money; but when you have a difficulty in getting milkers, are you not apt to get an inferior class of milkers?—A great many of the young men do not want any work on Sundays; they do not mind milking cows on week days, but they do not like to milk them on Sundays.

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8000. With your large experience, do you believe that the produce of the cows can be made very much poorer in quality through inferior milking, that is, through not having the cows properly milked?—I should not have thought that that would have altered the quality of the milk.

8001. An inferior milker will not get the whole of the milk, for one thing?—No. A good milker will get more milk. The better you can get your cows milked, no doubt, the more milk you get.

8002. And of a better quality?—Yes; it always pays to have the better people.

8003. You are not troubled yourself with bad milkers, are you?—No.

8004. (*Mr. Barham.*) You say that you think that the farmer's milk should not stand on the station all night before it is sampled for analysis?—I do not think it ought.

8005. Has your milk ever been sampled on the station for analysis?—I think it has many times.

8006. By the public inspector?—No, by a gentleman employed by the firm that buy it.

8007. When you say it ought not to stand there all night, you are referring, of course, to the public inspector—the sanitary inspector?—I think it is open to anyone that likes to go and tamper with it.

8008. True; but what I think you and the farmers in your neighbourhood should understand is this, that a sanitary inspector or a public inspector never, to my knowledge, takes a sample at a station unless he either awaits the arrival of the train or sees the milk come in or the railway porter hands it to him. No public inspector would ever think of going 12 hours after the milk had arrived, and then taking a sample for analysis. You spoke with regard to the time of the cows calving affecting the quality of the milk very largely. When you say that do you mean that everyone should regulate their cows so as to calve them down at certain intervals?—I do not think that is possible.

8009. I thought you said it was possible—that it was merely a question of regulating the calving of the cows?—I think it is then when the London season is on, we want the largest quantity of milk. There is a greater demand through May and June for milk; consequently, we want them to calve for then, and February, March, and April is the best time of the year for them to calve down.

8010. Quite true. So you think we could not eliminate that period of poor milk by rearranging the calving of the cows?—I do not think we could.

8011. I suppose you know, as a very large and experienced dairy farmer, that cows will not always calve down, and that you cannot arrange for the cows always to calve down just when you think you would like them to?—It is very difficult to get them to do so.

8012. Then you say that half of the quantity of separated milk could be added to your milk very well without the fraud being discovered. Is that correct?—At certain times of the year, in the fall, I think it is.

8013. Would you mind telling us what time of the year that is?—I should say from August, September, October, to November.

8014. Have you had your milk analysed?—Several times.

8015. How much per cent. of butter fat does it average in that period of the year?—I have known it show 15 per cent. of cream in the glasses and 4 per cent. of butter fat.

8016. If new milk has 4 per cent. of butter fat and an equal quantity of separated milk is added to it, surely the result will be to reduce the butter-fat down to 2 per cent.?—I think I said a large proportion of separated milk could be added.

8017. Did you mean that 50 per cent. of the separated milk could be added?—No; I meant 25 per cent.

8018. I thought you meant that the mixture could be half separated milk and half new milk, but you did not mean that?—No, 25 per cent.

8019. Then it reduces it to that extent. With regard to the churns, his lordship suggested that they might be protected to a large extent by being sealed, but you thought that milk could still be poured out of them quite easily, and water poured in, if they were sealed?—I think it could.

8020. I take it that milk could not be poured out of them into a bottle if they were sealed; a pail would be necessary then, would it not?—You would want a pail or a basin to pour it into.

8021. So that it would considerably increase the difficulty of its being adulterated in the event of the churns being sealed—it would be a certain protection?—Yes.

8022. How often do you have your milk analysed?—If I had any doubt that it was up to the standard I should have it analysed.

8023. Not very frequently, then?—Not very frequently.

8024. Do the people to whom you sell have it analysed?—I believe they have it analysed monthly or oftener.

8025. Once a month, would you say?—Oftener, I think.

8026. Do they send you a report of the result?—Not very often; but I have asked for it when I have been up there, and they have told me it is coming very satisfactorily.

8027. You say that if your milk is below the standard they would write you very sharp?—They would.

8028. And very quickly?—Very.

8029. How long have you supplied the present people?—I have never supplied anyone less than seven years at a time.

8030. Have you supplied these people for seven years?—Yes.

8031. How many complaints have you had during the last 12 months, say?—Not one complaint.

8032. So far as you know, you have always been up to the standard?—I can tell that by the glasses I keep; I always keep a sample every day of all the milk that goes.

8033. But the cream by measurement is always a variable quantity, is it not?—It varies a little.

8034. And is no true criterion of the amount of butter-fat in the milk?—It is a great guide to us.

8035. It helps you, you think?—Yes.

8036. The people do not fine you at all, or deduct anything from your account if your milk is not up to the 3.25? I have never been deducted for quality in my life.

8037. I think you found that during four months of the year the morning milk was not up to the 3·25?—I recommended 3 per cent., I think.

8038. Is your contract with them 3 per cent. for four months of the year?—3·25 all the year.

8039. And then for four months of the year you are not able to send that in the morning?—I think ours has always been over, but I do not wish to recommend 3·25. I think 3 is sufficient for three or four months.

8040. But you suggest that in many cases it might be not more than 3 per cent. for three or four months of the year?—I do not think we have ever been so low.

8041. Where did you get your 9·25 of solids not fat from?—That is on one of my contracts. I believe it is on Messrs. Welford's.

8042. Do you supply Messrs. Welford?—Yes.

8043. And one of the conditions of your supply is that there shall be 9·25 per cent. of non-fatty solids?—I have not got the contract here, but I think that is so.

8044. And from that amount of evidence you wish us to fix a non-fatty solid standard of 9·25?—I think the two together making 12·25, would be better.

8045. 3·25 and 9·25?—No; 3·0 and 9·25—12·25 the two.

8046. Which would you take, the 0·25 off—the butter fat or the non-fatty solids?—I think the two together would be best; combined.

8047. Instead of having a standard of 3·25 of fat and 9·25 of solids not fat, you would have a standard of total solids of 12·25?—12·25 for the two.

8048. (*Mr. Murphy.*) Can you tell me what you think would be the effect of a standard being fixed so far as the farmer is concerned? Do you think he would feel himself entitled to interpret the fixing of a standard as meaning that he was justified in abstracting cream from his milk if it were above that standard?—I think if we could get at a fair standard, it would be apt to raise the price of the milk. I think there is such a lot of poor stuff now put on the market, and that makes such a low price returnable.

8049. We have been told that a great deal of the milk

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that is produced would be at a standard above that which could be fixed by the Board of Agriculture, and it also has been suggested that if a lower standard were fixed farmers would think that they were justified, if their milk was above that standard, in reducing the quality of it?—I do not think there are more than two farmers in fifty who know what the standard is of the milk they are sending—I do not think so; very few take samples.

8050. You do not think the fixing of a standard would tend to encourage people to bring down their milk to that standard if they were already producing milk of a superior quality?—I do not think it would.

8051. (*Chairman.*) If anybody did do that it would not be the farmer?—I do not think it would; I really do not think so. That is why I recommended doing away with separated milk as much as you possibly can.

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Mr. James Long, called; and Examined.

8052. (*Chairman.*) You come before us as what I may call an expert on the question which we have to consider; you have an intimate knowledge of the various matters connected with the analysis of milk?—Not with the chemical analysis.

8053. But having been Professor of Dairying at the Royal Agricultural College, Cirencester, your knowledge of dairying as such is a large one and an extensive one?—Fairly extensive.

8054. You can speak to us as regards the quality of genuine milk from your own observation?—Yes.

8055. And all the points which you have entered on your *précis* here refer to matters within your own knowledge?—Yes, they do.

8056. Perhaps you will kindly take them in the order in which you have put them down, and tell us your own views as you proceed?—The first question is with regard to the quality of the milk. I put it in this way: that the quality of the milk that is produced for the supply of towns is about 3·4, excluding the Jerseys, the Guernseys, and the higher milkers that are retained upon the farm for butter making. I am dealing solely with the milk supplying towns.

8057. You say milk supplied to towns from the farms?—The average contains 3·4 of fat.

8058. What reasons have you for putting that forward?—I base the figure upon a very large number of comparisons made in this country and other countries, and at our dairy show and at the different exhibitions in the country, and of course upon many figures that have been published from time to time.

8059. I must ask you, please, to leave out of consideration any figures which are drawn from dairy shows, because this Committee has decided not to bring them within the scope of this inquiry at all. It is evident that in a great many cases they can hardly be relied upon as showing the general results of milk throughout the country where it is produced under its ordinary normal conditions?—Still my figure would be 3·4.

8060. Still, excluding those figures, you would give 3·4?—Yes. I may mention that Warington, who is an authority from a chemical point of view, gives 3·7, and in America the Geneva experiment station in New York State gives 3·9 as the basis of the testing of 17,000 cows. I have been there and seen their work. Fleischman gives 3·4, the figure I give myself. He is perhaps the greatest authority in Germany.

8061. Those figures are naturally very interesting, to show what is done in other countries; but we have to consider, more or less, what is the average result of the cows in this country?—Precisely.

8062. And what they can be expected to give under ordinary and natural conditions?—With regard to the solids not fat I do not propose to make any suggestion at all, because the figures are so misleading if you attempt to fix any standard. They may reach 10 with a low fat percentage, and they may be as low as 8, or a little more than 8. These are actual cases that I quote.

8063. Are those abnormal cases or are they averaged over a large quantity?—I think they were averaged upon a number; when I give you the extremes of course they are abnormal, but there are many actual cases that could be quoted. I have details of where 10 per cent. has been reached with a low fat percentage, and with a similar fat percentage a very low percentage of non-fatty solids, nearly as low as 8 per cent.; so that I think it would not be wise to make any suggestion with regard to the non-fatty solids at all. In 1894, before the Select Committee, I gave a large amount of evidence which was collected from various reliable sources, and I should not think it would be proper to repeat that evidence, because it is already in print. As you rule that the quality of milk in other countries has no bearing upon this case, I will not refer to what I was going to refer to with regard to the quality of milk in America.

8064. Of course, it is interesting perhaps, but at the same time we are not considering the circumstances of the American cattle, or the manner in which they are fed; we have to consider our own cattle?—Perhaps I might make the remark, which is rather made because I have taken some suggestions from the practice in America, that I attended the Commision in New York City, and was there shown the books for the year when I was there, and I added up column after column, and I brought out an average per cent. of fat 4·2. Then I may add that Mr. Lloyd, who is the chemist of one of the associations to which I belong, gave evidence to the effect—that is in 1894—that on twelve years' basis he made the total solids 12·6 and the fatty solids 3·6.

8065. (*Mr. Barham.*) Did you see the cows; can you tell us the breed of the cows that were in America?—No; the figures are of course taken from the books of the New York State Commission. The proposal that has been made that there should be a standard of 2·5 appears to me to be one which, if we adopted it, would simply destroy the trade, and I believe it would encourage adulteration, and would reduce the price of milk materially.

8066. (*Chairman.*) Does anybody advocate so low a standard as 2·5?—Yes, it has been advocated.

8067. Lately?—Quite lately, by prominent people, too.

8068. Are those prominent people producers or distributors?—They are distributors. It seems to me that in taking an average of the quality of milk in a case of this kind—in which we are dealing, I take it, with the milk supply of towns—that it should be taken from normal cows—I do not mean from Jerseys or Guernseys, but the cows that supply the milk for the towns. If I based my estimate upon any other class of cattle, or upon the whole of the cattle of the country, I should take a fallacious figure; therefore, I adopt what I conceive to be rather a low figure—3·4.

8069. Your second point is the influence of the hours of milking?—Most people know, I think, that the morning's milk is taken a larger number of hours after the evening milk than the evening milk after the morning milk, and in consequence the morning's milk is poorer than the evening milk, and the more you widen the difference between the evening's and the morning's the poorer the milk is, as a general rule—I do not say it is in all cases; but I think that is the general rule; and, *vice versâ*, the nearer you bring the evening's milk to the morning's milking the richer the milk in the evening. Consequently, I think that is one cause why milk is occasionally poorer than it ought to be.

8070. And with that knowledge you still maintain that 3·4 would be a safe figure to fix?—I do.

8071. Knowing that the morning's milk is so much poorer that the evening's?—Yes. I do not think that the consumer of milk should be prejudiced because of the system that is adopted by the individual who supplies him. If the system supplies a poor milk the system is at fault, and it should be remedied if it can be remedied.

8072. The consumer must alter the hours of having his breakfast and his tea?—I do not go so far as to say that.

8073. That is the only thing that remains?—I will take a case that occurs to me at the moment. I am myself selling only a small quantity of milk, which is taken in the morning at seven and in the afternoon at two—that is for convenience. It is quite possible the morning's milk—I do not know for the moment what it is just now—is poorer than it ought to be, and that the evening's milk is richer than it ought to be, but if the law existed I should certainly have to take steps to remedy that matter; and I could do so, but as the law does not exist I do not do it—I simply suit my own conditions to the state of the law.

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8074. Are these hours adopted for your own convenience or for the convenience of your customer?—Partly for mine and partly for his; I do not quite know which predominates. It is a matter of pure convenience; it saves one journey in my case, and it is convenient to him; if I had to take other hours I should have to make two journeys—that is the only difference. The next point is with regard to the stripping of the cow. My belief is, and this is based upon some experience, because I have kept cows of my own for a great many years although for many reasons I do not do what farmers usually do—I cannot go into the cow house myself very often to help them, or to see the cows stripped—but that the cows are not stripped very frequently I know to be a fact not only in the case of my own cows, but in many cases. I have heard farmers complain of the same fact themselves. When the cows are not stripped it is natural that the milk should be poorer than it ought to be. One friend of mine, who for many years had a large dairy farm, used himself to go round his cows and milk and strip every cow before the milk went away. In Lancashire there is a custom which I am very well acquainted with of selling the strippings of the cows and the fore milk separately at different prices. That, of course, is to the detriment of the consumer of the fore milk. But if a law existed, and the standard was a sensible one, then it would be impossible for these men to sell their fore milk. I quite believe that the practice of stripping might be adopted to improve the quality of the milk of bad or poor milkers. That is one method which might be adopted; where men know they have poor milking cows, in order to send out a milk of a higher quality they could take part of the fore milk away. The next point is with regard to the food. I refer to this because it is so frequently asserted, and those who make the assertion have very good reason, I have no doubt, for making it, although sometimes they are very much misled—that you can regulate the quality of the milk of the cow in accordance with the manner in which she is fed. The point I want to raise before the Committee is this, that you cannot improve the fat percentage of the cow by any manner or method of feeding. If a cow is normally fed, if she obtains a proper ration, then I say you cannot make her give more butter fat in her milk. But if she is underfed, that is to say, if she gets too small a proportion of digestible nutritious matter, or too small a proportion of either of the constituents of this matter, then she will fall away in her milk yield, or in the quality of her milk yield. I will give you a case in point. I used to buy milk from a neighbour of mine, a small farmer, who could not send to the station, and I found after a time, the milk being very poor, that he fed his cows entirely on mangolds; they got nothing else whatever, and it was the most extraordinary case I ever knew. I found that it would require two hundredweight of mangolds of good quality to provide these cows, or anybody else's cows with a sufficient quantity of albuminoids to provide them with their requirements; and, therefore, he was giving deficient albuminoids, and an excess of carbonaceous matter. It was no wonder that the cows gave, although a fairly good yield, milk of an extremely poor quality. I want to bring before this Committee's notice the results of an experiment on this point, which has been conducted by a German—Hagemann—with the object of testing this very question. It is one of many experiments that have been made by different men, but this is extremely good. It is quoted in the "Landwirth Jahrbuch." This man fed his cows on a certain quantity of cocoa shells, molasses, linseed meal, maize-cake meal, malt sprouts, and so on. This is recorded in the "Journal of the British Dairy Farmers' Association." To quote briefly the results, Hagemann says: "The results furnish no indication that the fat of the food affects the production of fat in the milk. The largest amount of fat was digested in the fourth period, but the milk in that period was poorest in fat. The ration in the third period contained considerably less fat, but the milk was richer in fat, and contained a larger total amount." There is a great deal more on the same question, showing that the fat had no influence at all upon the quality of the milk. Therefore, when practitioners state, as they often do state, that if they give a cow a rich ration they can ensure a larger quantity of fat in the milk, I think they are simply being guided by practice that is fallacious, whatever it may appear to be. Again, may I say this, that a cow, take a Shorthorn dairy cow, which averages 3·5 per cent. of fat in a given year, 1900 for example, will practically give the same proportion of fat in 1901. If it were not so, if we could feed cows and increase the butter fat which they give in their milk, we might very quickly make the Shorthorn a Jersey by the process of feeding alone; whereas, experience shows, I am sure, and practice as well, that the only method of increasing the milking property of cows is by breeding and by selection. I quite admit that if you give a cow a large quantity of watery food, such as mangolds, or an abundant quantity of grains or swedes, and hay of second or third rate quality, then you may satisfy their appetites, they will be getting bulk enough, padding enough, but they will not get the digestible constituents either in proper quantity or in proper relationships. My next point is with regard to the breed of the cows. During the last 20 years I have kept and bred the Shorthorn, the Jersey, the Guernsey, the Ayrshire, and three foreign breeds—the Dutch, the Swiss, and the Breton cow. Although for some considerable time I have made no tests at all, having something else to do; in times past I made a large number of tests by the aid of the Marchand system, that was then more in common use, and the Soxhlet system, and my remarks upon the quantity of the fat are based upon the tests made under those methods. The first thing I should like to remark is that in my experience a farmer producing milk can produce what quality he likes, of course within reason, by the system of selection, and by the system of breeding by selection, although I admit he is likely to obtain a smaller yield when he gets an increased quality. So far as the production of milk of good quality is concerned, I believe it entirely hinges upon price, and if the public would pay, as I believe they would, if there were less competition in the trade, a good price, the farmer would, and could, give a good milk—as good as they could possibly ask for. But the competition in almost all the towns with which I am acquainted is so extremely keen that there are swarms of little dealers in milk who are selling at cutting prices, and the result is that the farmers, who never agree amongst themselves, and who will outbid their next door neighbour, are practically willing to take anything they can get. To instance my own case with regard to selection, I once made an effort—or an experiment; perhaps I may dignify it by that name—to see what Shorthorns can do. I knew a dealer in Buckinghamshire, Mr. Birdsey, and I asked him to select me a number of Shorthorn dairy cows in the country—he is a large dealer—in order that I might make a selection from them. He selected about 30 cows, I went and saw those cows, and examined them and their milk, and selected eight from them, and took them home. At the end of the first week, or the first fortnight, I forget exactly which—it is recorded in the Journal of the Royal Agricultural Society—the butter actually obtained from those eight cows was slightly more than 5 per cent., and that was solely a case of selection.

8075. (*Mr. Barham.*) Was that butter or butter fat?—That was butter.

8076. (*Mr. Murphy.*) Was that morning or afternoon milk?—That was both.

8077. Mixed together?—Yes. If a standard were fixed, the careless farmer, I take it, of to-day would be compelled to select his cattle, as many do who keep butter-making dairies. In the districts such as Devonshire and Cornwall, where butter is largely made, the cattle are of a quite different character altogether than those you find in Bucks, Cheshire, and Staffordshire, and in the milk-producing counties, or in the cheese-producing counties. The next point is with regard to my own milk to which I have just referred. I have supplied milk to different farms for a good many years, and sold it by retail, and I have sold it in the sterilised bottles; but excepting one case, which is an extraordinary case and easily explained, in which the milk contained 75 per cent. of water when it arrived in London, I have never had a single complaint or a single case to my knowledge in which there was anything to complain of. In this case the man who took the milk to the station had charge of the cows in my absence from home for a week at the London Dairy Show, had been continually drunk, and had neglected his work; and in order to maintain the figures upon the record sheet which he has to fill in morning and night, he put down the same quantities of milk as had been put down in the previous week, and made up the difference in the churns with water. On my arrival home I looked at the record sheet, and found it so very accurate that I was led to suspect something, especially as he was being drunk from day to day, and I sent to London to the firm, and asked them to examine that morning's milk, and they did so, and they found it contained 75 per cent. of water.

8078. (*Professor Thorpe.*) Do you mean 75 per cent. of added water?—Yes, added water. In 1894, in my evidence before the Select Committee, I stated that I had never had milk below 3·3 to my knowledge. Then it

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was regularly tested for a long time. Of course, there may have been cases that I do not know of, but when I tested it regularly myself or had it tested, it was never below 3·3.

8079. (*Major Craigie.*) At no season of the year?—At no season of the year. I may add that I have kept a record for over twenty years, and have kept, when butter has been made, a very careful record, showing the ratio between the quantity of milk produced by the cows and the butter made. The last year is 1898 in which we made a good deal of butter, and the ratios then made weekly, excepting in two or three months when the milk was sold, varied from 2·1 gallons of milk to 3·07 gallons of milk.

8080. (*Chairman.*) What would be your average?—I did not take the trouble I am afraid to test that, but it would probably be about 2·6.

8081. About 2½ say?—About 2½; all the winter through it was about 2·1 or 2·2. With regard to the possibilities of mixing separated milk and new milk, bearing in mind the suggestion that has been made as to a 2·5 per cent. standard, I find that if you take a normally useful milk containing 3·5 per cent. of fat you can add on a 2·5 per cent. standard, 28 per cent. of separated milk, without any very serious fear of detection. With regard to this question I have taken the pains to get some details, and to get some experimental work done for me at various places; and I will take the first one—the Hampshire Dairy School. The milk at the Hampshire Dairy School on the day of the test contained 3·6 per cent. of fat, and Miss Campion, the instructress, who had made the test, found that she could add to that milk one-sixth of separated milk, or 16½ per cent. I say she found, I believe she did do it, because these cases were all tested.

8082. When she had done this what did she find?—She found that it was not below 3 per cent.

8083. It would still not be below 3 per cent?—Not below.

8084. (*Mr. Barham.*) Would you mind telling us again the experiment?—Miss Campion, of the Hampshire Dairy School, tested the milk of a day, and it contained 3·6 per cent. of fat; she added separated milk, and, while maintaining the 3 per cent. standard or 3 per cent. limit, she added 16½ per cent. of separated milk. In a second test which she made the milk contained 4·1 per cent. of fat, and she was then able to add 33 per cent. of separated milk and still have 3 per cent. of fat. At the Dairy School, Kingston Fields, near Derby, Mr. Blackshaw, the principal there, was able to add, he says, between 10 and 11 per cent. of separated milk and still keep to the 3 per cent. standard. The average fat there, all of which is tested, is 3·6 per cent., so that upon that average he says 20 per cent. could be added. At the farm school and dairy of Cheshire at Holmes Chapel, Mr. Gordon and the chemist, Mr. Druce, made a similar test. They found that the average quantity of fat in the evening's milk was 5 per cent., which would allow the addition of 40 per cent. of separated milk.

8085. How much in the morning's milk?—I have not got that, and I did not ask for that. Mr. Benson, with one of the instructors at the Reading College, Mr. Walker, made a test at the British Dairy Institute. He found that it was possible to add about one-third of the volume of the mixture of 31·6 per cent., which would be nearly one-third; that is, ten pounds of evening's milk containing 3·95 per cent. of fat were added to 3 pounds 3 ounces of separated milk, and the mixture contained 3 per cent. of butter fat. Mr. Walker, I should say, is a Bachelor of Science. The next case is of a large retailer and wholesale buyer of milk and seller in the north. He made four tests. He added two pints of separated milk to eight pints of new in each case. In the first case the new milk contained 3·9 per cent. of fat and 8·4 per cent. of solids not fat; in the second it contained 3 per cent. of fat and 8·4 per cent. of solids not fat; in the third case 3·3 and 8·6 respectively; and in the fourth case 3·3 and 8·4. At the Monmouthshire Dairy School two tests have been made, and the milk was found to contain 3·5 and 3·6 per cent. of fat respectively; the addition of separate milk in one case was 14 per cent., and in the other 16½ per cent. At the Gloucester Dairy School it was found that 35 per cent. could be taken from the milk tested; I take it that this means that 35 per cent. could be added. I will refer to the letter: In sample A, which appears to have been the new milk, the fat contents was 4·7, and the solids not fat 8·2. This was evening's milk. After the mixture the fat present was 3·5, and the solids not fat 8.8. The skimmed milk contained rather more fat than it should have done, namely, 0·4. The last case I have got is taken by an expert, who is also in the milk trade, at the present time; he is an expert of very wide experience. He says: "I added in duplicate one gallon of separated milk to three gallons of new, with the result fat 3·05." In the second case he added one gallon of separated milk to three gallons of new, which was watered down to a specific gravity of 1032, the result being 3·05 of fat. The actual specific gravity of the milk was 1032, of the separated milk 1036, and of the mixed milk 1033 while the fat in the separated milk was 0·15. With regard to the result of the institution of a standard in New York City the Commissioner told me that there had been an increased consumption of milk to the extent of 90 per cent. in nine years, although the population had only increased by 25 per cent., and this was with a 12·50 per cent. standard of total solids.

8086. (*Major Craigie.*) Could you say what it rose from to the 12·50, what was the rise of standard which caused that rise of consumption?—It was not a raising of the standard, it was the institution of the standard.

8087. (*Chairman.*) Can you say how that standard is broken up?—No, I cannot; I do not think it is broken up at all in New York City; in New York State it is. It is 12 and 3 outside the City. In the City of Boston they have a 13 per cent. standard.

8088. (*Professor Thorpe.*) What I understand you are showing is what was the eventual effect of the institution of a standard, namely, that there was a very large increase in the amount of milk consumed, although there was not a comparatively similar increase in the population, is that so?—That is so.

8089. (*Chairman.*) Could you say of your own knowledge whether the same thing does not hold good in this country—has there been a large increase in the milk consumed of late years?—Undoubtedly.

8090. And has that increase been considerably faster than the increase in the population?—I think so unquestionably, owing very largely to the enterprise that has been exhibited in trade. These figures are taken from a volume entitled "The Milk Supply of Boston and other New England Cities" [the United States Department of Agriculture], by George M. Whittaker, M.A., Special Expert Agent, Dairy Division, under the direction of Dr. Salmond, Chief of the Dairy (Animal) Industry. In 1886 there were 8,700 samples, with 88 cases taken into Court; in 1897, the last date that is published here, there were 12,295 samples taken, and only 129 cases taken into Court, so that although the standard is 13 per cent. 129 cases only came into Court in a city of some million people.

8091. (*Mr. Barham.*) You do not know the system of analysis there, I suppose, do you?—I do not. The writer says that convictions followed in 90 per cent. of the cases. In Maine, cities and towns of not less than 3,000 inhabitants must appoint their own milk inspectors. With regard to a point that has been raised outside, that in the case of milk which has been mixed the adulteration could be detected by the non-fatty solids, I would suggest that if a small quantity of water is added—of course, it must be done with very great care and by an expert, but farmers and others have very great facility for picking up these little notions—you could defeat anything in that way. The solids not fat are not an indication, although I think it is possible that the ash of milk might be a slight indication, but not sufficient to warrant a prosecution. I mention the point because I think the whole question hinges upon the mixture of the two milks, and so long as we cannot detect the mixture, then there will be a continued adulteration unless a standard is fixed. I want to quote a case, if you will permit me, in order to show precisely what is being done. This I have from a member of the trade in a very high position who tendered for a contract, I believe, to a hospital, but I cannot say positively from memory; he did not get the contract. He was supplying a customer at the time who did a little business upon his own account in putting in tenders for contracts, and this individual got the contract, but he obtained the milk from my friend. My friend's argument is this—of course, it is not a matter of proof, and I do not suggest it is, but he says: "I could not possibly sell my milk to the hospital, but I could sell it to my friend at a profit, and he could sell it to the hospital," and my inference is that he added some separated milk to it with the usual result. Some few years ago a proposition was made to me by a man in the trade, or, rather, who had been in the trade, and who was anxious to get into the trade again; he said that he had made his money by the practice of mixing the two milks, which I need hardly say is very simple.

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8092. Did he suggest that you should go into business with him?—Myself and others. With regard to the question of what a standard should be, before the Select Committee I proposed 3·25 of fat. I would adhere to that to-day if I could see my way to its being adopted, but I do not see my way to its being adopted, and therefore I propose 3 per cent. of fat and 12 per cent. of total solids.

8093. Does that mean 12 per cent. of total solids with not less than 3 per cent. of butter fat?—Precisely so. In America, in the State of Maine, that is precisely what the standard is. In Michigan, in 1894 (these are all 1894 figures, and they are official), the standard was 12·50 and 3; in New Hampshire 13, in New York State 12 and 3, in Ohio 12·50 and one-fourth fat except during May and June, when it is reduced to 12; in Pennsylvania it is 12·50 and 3; in Wisconsin it is 3 without any total solids; in Indiana there is a fine inflicted upon men who retain the strippings of the cows, and also in Kansas; in Massachusetts the standard is 13 and 9·3 of non-fatty solids except in May and June, when it is 12; in Minnesota 13 and 3·50; in New Jersey 12; in New York City 12·50; in Vermont 12·50, and 9·25 non-fatty solids, which in May and June is reduced to 12.

8094. (*Major Craigie.*) Are these quotations from an official report?—They are.

8095. Do you know what report?—I think it is the New York State report—one of those big black volumes; I daresay you have it. With a higher standard than 12 and 3 I should suggest that the three months of April, May, and June be omitted, or that the standard be lowered during those three months.

8096. (*Chairman.*) Then you would allow a latitude in these special months?—Yes. If the seller of milk can reduce the quality for his own purposes by mixing, I suggest that he can also mix the milk for the purpose of increasing the quality. The Board of Agriculture might without very much trouble indeed obtain a very good idea of the actual quality of the milk of the country by making 100 or 200 tests in different counties. With regard to the standard for skimmed milk, I do not think it is required, because I think that adulteration can be shown by analysis, and, indeed, almost by the specific gravity test. It has been often mentioned in controversy outside that milk taken from counter pans and retailed in churns on different milk rounds it liable to be poorer than it ought to be in consequence of the fact that the cream rises to the surface. My point is that I do not think the buyer should be prejudiced because of the fact that cream rises to the surface. It is perfectly well known that were a law passed the retailer or whoever sells the milk would have to take certain precautions to prevent the cream rising to the surface. That is done now by many cheese-makers who get milk at night for the morning's cheese-making, and if they can do it, then I maintain that the retailer who can mix his milk twenty times a day if he chooses without any harm should be able to do the same thing.

8097. Have you considered the case of a man with a sealed or locked can in a barrow, who draws off his milk from the bottom of the can?—That is precisely the case I have in my eye—drawing off from a tap at the bottom.

8098. How is he to mix it?—That is his business. I do not propose to suggest that, because I am not sufficiently a mechanician.

8099. It is really a question of mechanism then?—I think so. In connection with this one question I wish to suggest that I think instead of simply registering the retail milk seller he should be licensed at a nominal fee of, say, 1s. Milk plays such an important part as a food, affecting health in particular, that I think, especially as public authorities now have the power to inspect those places, and in many cases do inspect them, both farms and dairies, that it should be a matter of licence, and that a man whose premises are not sufficiently clean, and are not kept in proper order for the sale or maintenance of an article like milk, should have his licence withdrawn. Similarly, if, say, after the sixth conviction for selling inferior milk he is caught again, he should also have his licence withdrawn, or he might have his licence endorsed, as a cabman does or a publican does. I do not think that would be a hardship at all. It would be far better to endorse a licence or withdraw it than it would be to put a man in prison, as so many have advocated. Next with regard to the security of the farmer. There are many methods in which the farmer can secure himself, and personally, if I were attending to my own business from day to day, I should have no hesitation whatever in offering milk of a much higher quality than 3·25. The farmer can, in the first place, test his cattle, and I believe that it is only a matter of time for milk to be sold in accordance with its quality. We have now at least two first-rate machines which will enable any man with a little experience—a few days' experience indeed—to test his own milk in ten minutes. He could test it before it goes from the farm, and put upon a label on the churn the actual percentage of fat that it contains. In the first place, I think he should test his cattle when he buys them, or when he breeds them, and as they come into the dairy discard those that are poor milkers and replace them with rich milkers; then that he should daily test his milk, as I have suggested, see that the cows are stripped, omit to milk all known poor milkers (I am assuming that he does test his cows), or take their fore milk away; then that he should study the system of feeding better in order to prevent the forcing of quantity and the ignoring of quality; that he should take an especial precaution not to milk in the morning so long after the evening's milking, or perhaps, in other words, to milk at a more suitable hour in the evening; and, lastly, that he should add, if necessary, rich milkers to his herd, such as Jerseys, or Guernseys, or Devons. I have a case that I want to refer to if you will permit me for one moment. On a number of farms I have the details of the actual quantity of solids not fat and solids fat that were given by cows on different dates. There are a good many cattle in the herd on these farms. The argument of the owner of cows is: Because I have a cow which on a certain day gave me only 2·4 per cent. of fat, it would be very hard for me to be summoned because my milk is poor. In each of those cases it is very evident that the matter is easy of solution, because the large majority of the cows give very good milk indeed, some very rich milk, and therefore the poor milkers being known could be withdrawn, and replaced very easily by good milkers. I refer to this because it has been made a great deal of, not only this case, but other cases of a similar character, and I think they are very easily answered. May I refer to a letter I have from a very large London trader who owns a herd of cattle, and who is a strong opponent of any standard unless he is (and very properly, I say) protected in some way? This gentleman is willing to accept a standard of 3 and 12 contingent upon something being done to protect and cover, as he terms it, the just man. This gentleman would be satisfied with an appeal to the herd—that I will deal with in a moment. In another case a large retailer writes to me—a man I know very well indeed—and he says: "In all my experience as an expert and as a milk retailer I have never but twice known the milk of a herd fall below 3 per cent., and then I believe it to have been owing entirely to carelessness." I would suggest that in some cases where samples are taken, whether of individual cows or of herds, that the samples are not reliable samples; that, in the case of the individual cow, she may have been in an abnormal condition or out of health, or, in the case of the herd, that the herd might not have been stripped. Now, with regard to the appeal to the cow. In the first place, how can you fix the producer of the milk that is taken? If the milk is taken in the London streets by an inspector and sent to the analyst, nothing can possibly, in most cases, fix the herd from which that milk came. But there are cases in which you can fix the source, and in those cases I would suggest that the milk should be analysed immediately, say within twenty-four hours; that evidence should be obtained showing at what time the cows were milked, and that the inspector, with the medical officer of health, should see the same cows milked at the same hour on the morning after the sample was analysed, that is to say on the second morning afterwards. It appears to me that if you do not do that you might be open to all sorts of complaints of unfairness, because cows do change with the weather. They shrink in quantity, and they increase in quality, and the result would not be satisfactory unless some plan of that kind were adopted.

8100. Would you not object to be put through that process yourself, supposing you had sent the milk on Monday which was not considered to be up to the mark, would you think that it would be a fair test to milk your cows on Wednesday morning and to be judged on that?—I think I should be very glad to have the chance of doing so—I think so.

8101. You think that would be a fair judgment?—I think so.

8102. You do not think in the course of those two days the milk would have varied so much?—I think it would be most unlikely to do so.

8103. We have had evidence this morning that even the very next morning—the Tuesday we will say—the

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milk will vary as much as 0·5 per cent. of butter fat?—I quite agree with that; so it might, but I think it is very unlikely to do so. The occasions upon which there is such a change in the weather are not so common as that. Most men who feed their own cattle, or see them fed, take precautions, in the case of a sudden frost for example, to give them an extra ration; they take some precaution to maintain the yield. Most men do that. They pay far more regard to the yield, the bulk of the milk, the volume of the milk, than they do to the quality. I know from experience it is a common thing to do; if you suspect late at night that the cows may fall off by the following day then some precaution is taken in the way of feeding an extra ration to prevent it.

8104. Supposing your milk on Monday morning showed 2·5 of fat, and the appeal to the cow on Wednesday produced 3 per cent., you would be rather in an awkward position, would you not?—Precisely so, I think that would be evidence that the milk had been tampered with.

8105. We will suppose on Monday it was genuine, that there had been a touch of frost, and that you had not given beet or cake, or whatever was necessary to prevent it you would have been in an awkward fix?—I think I would be, but I do not apprehend that anything of the kind could possibly occur. I would be very sorry to propose a standard of 3 per cent. if I thought it could occur; I do not believe anything like that occurs in the whole of the country.

8106. There was a gentleman sitting in that chair this morning who had figures to show that a cow would vary as much as that from one morning to the next?—One cow might, but not a herd.

8107. I distinctly asked that question whether it was a single cow or a herd, and he said a herd?—I do not believe him; I must say that.

8108. We pressed him on that point; I asked him whether it was a herd, and he said there was a variation of 0·5 between the herd one morning and the next?—I have no doubt the gentleman believed it himself, but there are so many fallacies in agriculture that unless you have a thing conducted by people who are used to conducting experimental work you cannot get at the real facts of the case; we persuade ourselves of all sorts of things. How would it affect the trade is the next point I have in my mind. I believe that the dishonest trader and the careless trader would be weeded out largely, because I do not think he could live and carry on his present careless, dirty, and sometimes nefarious trade under a system with a standard. With regard to what I may term the legitimate trade, it is quite able to take care of itself, and quite able to protect itself. I think it would be possible that the trade would have to pay better for the milk that it buys, and consequently would charge more to the public. I am speaking now really from experience, because it has been a costly one to me. Labour is dear; I am myself paying my men—six men—an average of £1 a week, and then you are glad to get them. Of course, I am near London. They do not like cows; you cannot get men that like cows; they hate the work, and they shirk it if they possibly can. This is getting more and more difficult till the milk trade, so far as the farmer is concerned, will not be worth his attention at all. I am quite convinced that we cannot expect, and that we have no right to expect, the farmer to produce milk at 6½d. as a maximum. Perhaps sometimes a man gets a little more, but 6½d. is a very fair maximum price in summer, when he has to get up very early in the morning and milk his cows, and feed them, to keep the place spick and span under the new regulations, and further to see that there is no tuberculosis or disease, and that that milk is, as it is proposed to make it higher in quality. We cannot expect that. Therefore I believe that should there be a standard fixed the farmer will expect a higher price, although not being so strong as the trade he may not get it for some time; but I think that would be the inevitable result. Dealing with the question of the trader, I think he is quite able to take care of himself, because he has means of taking care, which the farmer has not. The trader would, in my judgment, require the farmer to supply milk above the standard, whatever it might be, and there his function would cease, except as regards his own employees. If I go to a firm in London, and I say "I want to supply you with milk under the new standard," they would say:—"Well, are you prepared to do it? Are you prepared to abide by the standard?" That would be the natural consequence. That milk would be tested from day to day, I apprehend, or it should be, and there the thing would cease; but still the trader would be in the same position that he is to-day as regards its being adulterated by his employees. I think that under the standard system the cheaper contracts that are now somewhat common would be lost to many of those who obtained them. The next point is the probable cause of low quality in milk. I think the probable causes are the addition of water, of machine skimmed milk, of machine skimmed milk and water together, of bad feeding, of failure to strip the cows, of milking too many hours apart, and of the possession of inferior milking cows. I take it that the inferiority like the superiority of the milker, lies in her individuality. In part these causes are owing to carelessness with counter pans, and with churns that are taken in the streets for retailing milk. The next question is with regard to cream. No doubt the Committee know that cream is thickened in different ways. It thickens naturally as it is on the way to decomposition, and it is thickened by artificial means for sale when it is placed upon ice, for example. Therefore it may happen, and it does happen, that the consumer in buying thick cream, buys cream that has been artificially thickened, and which is not thick because of the quantity of fat it contains. I believe that 34 per cent. represents the figure as regards clotted cream, whereas ordinary cream, which varies enormously, may be taken to contain from 30 per cent. to 68 per cent. of fat. Where cream is separated for sale, as in the small jars that are now retailed so largely, from 8 to 10 per cent. is taken from the milk—probably an average of about 9 per cent. That I have been into myself practically, and therefore I know with some preciseness what really is the case. Should there be a standard fixed for cream I think it should be about 40 per cent., but if cream could be sold in its natural condition simply from the machine, unthickened either by gelatine or by ice, then I do not think a standard would be necessary at all.

8109. You can produce cream of different thicknesses from the machine?—Precisely so; you can.

8110. Until it almost ceases to be cream?—Precisely so.

8111. And yet you would have it coming from the machine without any standard?—I think so if it were sold in its natural condition, because the public can then tell what it is like. If you can pour it out from a jar like you can what they used to call thin cream, then the buyer would be willing to only pay a thin cream price, but if it was very thick he would be willing to pay a thick cream price.

8112. Then cream naturally would find its own level, so to speak?—I think so. I used to supply a city restaurant with thick cream. It was a vegetarian place, and I went there once and took some lunch to see what was being done. The first thing I found was that this cream as it came from my dairy, was being thinned with new milk, and so taken round to the customers; in fact when I spoke to the proprietor he admitted it, and he did not see any disgrace in it at all—he thought that that was quite proper. So there are methods of proceeding in that matter which are not regarded as being unfair.

8113. (*Mr. Barham.*) Do you suggest that restaurant proprietors should not be allowed to do that?—I think they can do it, just as they like, so long as there is no suggestion——

8114. You would not suggest that a standard should be made in order that restaurant proprietors should not be allowed to thin the cream down as they thought proper?—No. I suggest that a standard should be fixed only in the case where cream is sold artificially thickened. So long as it is artificially thickened, then I think there might be a standard of 40 per cent. This is a case I do not press at all; it is only a suggestion. I think that is all I have to say. My general recommendations have already been given.

8115. (*Professor Thorpe.*) I suppose the chief form of sophistication in milk is now-a-days the addition of separated milk?—I believe so.

8116. It would be very useful, no doubt; if there were some method of ear-marking separated milk?—Yes.

8117. You gave evidence, I think, before the Committee on Preservatives, did you not?—Yes, I did.

8118. On that occasion you strongly deprecated the use of preservatives; if I remember rightly?—I did.

8119. You pointed out that in a well-conducted establishment there really was no necessity for the use of preservatives?—That is my opinion.

8120. Do you happen to know the provisions of the German Margarine Law?—No, I cannot call them to mind; I have them at home, I have no doubt.

8121. Do you know, for example, that it is now necessary by the law of Germany to add a certain proportion of a certain oil—sesame oil—to the margarine?—I do not know that.

8122. Perhaps you will take it from me that now all margarine in Germany is mixed with a certain percentage of sesame oil, thereby ear-marking the margarine, and therefore the addition of margarine to butter can be detected by the presence of the sesame oil?—I am glad to hear that, because I assisted the Danish people through their Commissioner, in making a test with sesame oil, and they could not find any reaction in cream.

8123. That is another thing; I am talking of butter?—Cream for making butter.

8124. It is equally true that the sesame oil does not go into the cream; if you feed the cow even with sesame cake, the sesame which is in the cake does not go into the milk at all; there is no trace of it. Therefore, there is no risk of butter getting by mistake mixed with sesame, and so the presumption of the admixture of margarine can be based upon that. However, that being the case, if we could ear-mark, say, separated milk by a somewhat similar method in point of principle, that is to say, adding something to the separated milk?—Starch.

8125. Which is not noxious, and which is easily detected, that might be one method at all events of stopping this fraud, might it not?—Yes, it might.

8126. Have you followed all the evidence given before the Preservatives Committee as it has appeared in the public prints?—I have seen a good deal of it.

8127. Do you know that it is contended by certain persons who have given evidence before that Committee that boracic acid and borax are perfectly innocuous substances?—Yes, it has been so contended.

8128. It has also been contended by medical witnesses—medical officers of health and others—that there is some good reason to suppose that the indiscriminate use of these preservatives in fresh milk is attended with a certain amount of hurtfulness to children?—Yes, it has been.

8129. I think you yourself gave evidence showing the pernicious effect of borax and boracic acid?—I am afraid I did.

8130. Supposing we take those gentlemen who allege that boracic acid and borax are perfectly harmless substances, compel them to put it into the separated milk, and insist upon its exclusion from fresh milk, then we should have one method of ear-marking the separated milk, should we not?—Yes, we should certainly.

8131. Boracic acid is very easily detected in milk, is it not?—I believe so.

8132. (*Major Craigie.*) I think you regard the question of price as really governing the production of milk?—Yes, I do.

8133. If a better price than is now obtainable were current, milk of a higher quality could and would be produced?—Under a standard.

8134. You do not recommend that milk should be sold at more than one price in different grades, do you, as prime milk and other milk?—I will not go so far as that, I have thought it over, but I cannot quite see that it would be practical.

8135. I want to get at your own view on that point?—I would not like to commit myself to that.

8136. You have thought of the question?—I have thought it carefully over several times.

8137. And you see great difficulties in the way of there being two prices for an article like milk?—I do not see difficulties as regards the sale, but I see difficulties as regards the trade. I will give you my reasons. Having the pleasure to know very many gentlemen in the trade, and having many friends amongst the members of the trade, I have often talked of it, and they have ridiculed the suggestion. They would not hear of such a thing, and I think they would offer the most uncompromising opposition to anything of the kind.

8138. I think you referred in one of your answers to his lordship to the increased consumption of milk in this country as well as in other countries in recent years, and said that you felt no doubt at all about the fact of there being a great increase in the rate per head of consumption; do you base that upon any figures that have been published in the matter, or what was your foundation for that belief?—I am afraid that I cannot say they are very precise; they are rather general than precise, but from close connection with the industry, and from what has been published from time to time. I do not think I can give any precise data for my opinions.

8139. You know there is very little, or no increase in the number of cows in milk and in calf in this country?—Yes, I do.

8140. That in proportion to the population there is probably a rather smaller number of cows than formerly existed in this country?—Yes.

8141. Although there has been an increase in very recent years?—Yes.

8142. But over a long period there has been no increase in the producing animal?—Quite so.

8143. Then would your contention be that the yield per cow has increased?—Yes; with the increase of butter and cheese as regards the imports. I think the imports of butter and cheese have affected the yield; they have thrown more whole milk upon the English market.

8144. You mean that more milk is consumed as raw milk, and less milk is manufactured into cheese or butter?—Yes, precisely so.

8145. Would you say that that fact, if it be a fact, or at least that assumption, suggests the great importance of having more care taken in the standard of milk itself?—I think so.

8146. It is becoming a larger article of diet in the country?—Yes.

8147. Then the farmer is really, when he produces milk, thinking more of milk than of butter or cheese?—Yes.

8148. Would you suggest that the increased standard that you propose here would tend to improve the quality of milk?—Yes, I feel quite sure of that.

8149. I think I gathered that you advocated the control of all retail milk shops?—I advocated that they should be licensed.

8150. Controlled by means of a licence?—I do not say that; I would infer that they are now under a certain control of the local authorities.

8151. Under the Dairy and Milkshops Order of the Local Government Board?—Yes; but that if they were required to take out licences at a nominal fee those licences could be endorsed, under certain conditions which I suggested, for two reasons, the first of which was that I think there should be some penalty in case a milk shop is not conducted as it ought to be under the Local Government Dairy and Milkshops Order, and next that if a man systematically sells milk of inferior quality, or milk that is adulterated, he should pay some penalty other than the simple fine that he pays. It appears to me that an endorsement of the licence, and ultimately the withdrawal of the licence, would be a more severe penalty, and would be more efficacious than to fine him £100, or to put him in prison.

8152. Would not a breach of the present Order be a matter of subjecting him to punishment?—I think only to a fine; I think it is only very nominal.

8153. You mean that something might be added?—Yes, added to that.

8154. Have you any recommendations to make to us or any suggestions to give with reference to the case of condensed milk, which comes within the purview of this Committee? You did not mention that in your evidence in chief, but have you ever thought of having a standard for condensed milk?—I went through it in my mind only last night before coming here, because I looked over my evidence before the Select Committee. I do not see my way to make any recommendation with regard to the fat contents of condensed milk, because I think the present power of the analyst is sufficient to control that altogether.

8155. In what way?—Should there be a standard fixed, for example, for ordinary milk, he will know precisely what milk there should be in a pint of condensed milk.

8156. He would have no difficulty in determining what should be the degree of condensation?—I think not; that is very well known.

8157. Would you say that that differs in the case of different forms of condensed milk?—It would differ simply in the case of different qualities. I gave a lot of evidence upon that point before the Select Committee which was taken from practical sources.

8158. But you have no suggestion to make to us?—I have no suggestion to make now on that point.

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8159. Have you considered that the use of condensed milk has increased in a still greater ratio than the use of ordinary milk in this country?—I do not think it has.

8160. How do you account for the larger importation; do you think that condensed milk is used at all for some manufacturing or other purpose?—I cannot say that I have seen the figures lately, but I do not think they are unreasonable, considering the increase in the population.

8161. Condensed milk is largely used for the shipping trade and for travelling, is it not?—Yes, very largely. I do know—I should not perhaps use the word "know"—but I believe for many reasons that there is an increase in the consumption of skimmed condensed milk or partially skimmed condensed milk sold at lower prices.

8162. That would not be a reason for your fixing a definite standard?—No, I do not think so.

8163. Would you consider that the new provisions of the Act of last year would be sufficient to meet that point that you are referring to now? The selling of skimmed condensed milk without declaring it to be skimmed condensed milk is now an offence, as you are aware, under Section 11 of the Act?—Yes, I know.

8164. The cans must be labelled and marked in a particular way?—I do not think the maker could be asked to do any more than to label the tins; but I do not think the labels are large enough, they do not come up to the recommendations made to the Committee of the House of Commons.

8165. Have you heard of any cases of prosecution?—No, I have not.

8166. Your attention was not called to a recent case in the west of London, in which the sellers of condensed milk have been fined on the ground of the label being insufficiently marked?—No, it was not.

8167. You have no suggestion to make to the Commitee on that point?—Not any suggestion at all.

8168. (*Mr. Murphy.*) You referred just now to standards in America; do you know what effect the fixing of those standards has had upon the higher quality milk—whether it has tended to equalise the qualities of milk by getting rid of the worst, and bringing down the higher quality milk to a lower level?—It has had the effect of increasing the general quality; I cannot speak with regard to the highest quality.

8169. It has been suggested to us that fixing a standard would have a double effect—not only getting rid of the worst, but perhaps reducing the high quality of some milk that is now on the market?—I cannot particularise without the data at my finger's ends or before me, but in some States they allow milk under standard to be sold as skimmed milk, whereas in one or two States they will not allow skimmed milk at all as we understand it, but if it is below the standard it is called skimmed, and sold as skimmed at a lower price; that is the only point that strikes me at the moment.

8170. You have no recollection of hearing of any disadvantage in respect of the higher quality milk attending the fixing of a standard?—I do not quite gather what you mean.

8171. It has been suggested to us that the milk producers would feel that they need not produce milk above the standard fixed?—I see your point.

8172. And inasmuch as that standard must be fixed comparatively low to meet the conditions of milk producers, it might encourage people to bring down their existing high standard to a lower standard?—I see. That point I have often thought about. I think that if the Government fix a standard it ought to be clearly intimated that that would not in any degree minimise the effect of the existing law—that if a man had a milk containing 4 per cent., he must not adulterate that milk any the more because of a standard of 3 per cent.

8173. There probably would be experience in America that might throw light upon that matter, do you not think so?—Possibly, but I do not know of any.

8174. Do you know how long the standards have been in existence there?—Certainly since 1894.

8175. You mentioned the States of New York and Maine, I think?—In a number of States there are standards.

8176. You suggested the standard for butter fat should be 3 per cent.?—Yes.

8177. I think you added some words—"because you felt it was impossible"?—I had previously recommended 3·25, before the Select Committee, but believing there is no chance of getting 3·25 in the present state of public opinion, I prefer to recommend 3 at the present time.

8178. If you were to dismiss public opinion from your thoughts altogether, and speak absolutely from your own knowledge, what standard would you suggest?—3·25. May I add to that that the Manchester Corporation has only within the last three weeks advertised for milk for the supply of their two hospitals which must contain 3·25 of fat? Had the time of closing for the reception of tenders been passed, I hoped to have been able to give you the number of tenders and possibly the prices. That standard was taken, I am given to understand, from my evidence before the Select Committee.

8179. (*Mr. Barham.*) You say the quality of the milk may be very greatly improved by breeding and selecting?—Yes, I believe so.

8180. You have been improving your cows by breeding and selection for a great number of years?—I did not say that.

8181. May I ask how long you have been keeping cows?—Certainly—23 years.

8182. Have you not been endeavouring to improve the breed and to select them to give you better results during that time?—To tell you the truth, in breeding, the most I have tried to do is to increase the quantity of the milk, and I have succeeded in doing that.

8183. Then you have not by breeding and selecting improved the quality of the milk of your own cows?—No, I have not, I have been trying to do the reverse.

8184. But as a matter of fact, what you have told us is that during a number of years—I do not know how many—your milk has never been below 3·4 of butter fat?—3·3.

8185. Does that mean the average of the day, or does it mean the milk of either meal?—That is the minimum figure of the whole analyses—of the whole tests that were made.

8186. 3·3 is the minimum figure of any one meal and of every one meal that you have had analysed?—Yes.

8187. So that is really the minimum of what your cows are giving at any one time?—Yes. They have not been analysed always or tested always.

8188. Then you tell us that in 1898 it took from 21 to 38lbs. of milk to make one lb. of butter?—2·1 to 3·07 were the figures.

8189. Would that come out more than 3 per cent. of butter fat?—Yes, I think so; a little more; I have not worked it out.

8190. You see it is very near a third of 100lbs.?—Yes.

8191. And butter contains at least 15 per cent. of foreign matter other than butter fat, so that, judged by your two sets of figures, there is a discrepancy somewhere, and a considerable discrepancy. Either your milk could not have given more than 3 per cent. of butter fat, or you must have taken less milk to make your pound of butter?—The figure is right. No doubt possibly the milk may have been poor, because there were Dutch cows in the herd all the time.

8192. Then when you say that your milk has never been less than 3·3, it is not correct?—I am afraid I must take exception to that. I said that I gave evidence before the Select Committee in 1894, in which I stated that on no occasion had the tests shown less than 3·3. I gave that evidence in 1894. These figures that I am referring to now, as regards the butter made, were in 1898; I specially named that.

8193. Since 1894 your cows have on, I presume, many occasions given milk containing not more than 3 per cent. of butter fat?—Very likely they might have done that.

8194. And yet you come here and advocate that no dairyman should be allowed to sell milk with less than 3·25 of butter fat in it?—Precisely.

8195. Or that if he does so it should be made penal?—Yes.

8196. And that all farmers throughout the country should be compelled to produce milk of that quality?—Yes, I do, certainly.

8197. Just one other point, and that is with regard to the samples obtained in London; you say that you consider that the appeal to the cow should be made on the following day or within two days?—Within two days

8198. By the medical officer of health and by the sanitary inspector?—No, by the inspector—the man that takes the sample. I said the inspector—the man would be the man who took the sample of milk.

8199. I think you said the Medical Officer of Health and the Inspector?—And the Medical Officer of Health.

8200. Do you withdraw the Medical Officer of Health now?—Not at all.

8201. Are you aware that some hundreds of samples are obtained in London on one and the same day? Do you know that in one district alone there will be as many as 20 or 30 samples taken on any one day?—Very likely.

8202. How is it possible for one medical officer of health to proceed on the second day to 30 different farms, or to farms in 30 different parts of the country, to verify those samples; it is not practical, is it?—Well, that is a most unlikely thing altogether.

8203. It is constantly the practice in our neighbourhood for quite a number—20 or 30 samples—to be taken in any one district on the same day?—I am assuming, because we are bound to assume in a case of this kind; of course it is a matter of experience—that if 30 samples of milk are taken, they would not all be adulterated, and further than that they would not all be traceable to the farms. Only a very small quantity would be adulterated, and supposing five out of the 30 were, the possibilities are that not more than one could be traced to a farm. Then the Medical Officer of Health, or his deputy, would be able to go.

8204. Then the men who sold the other 29 would have no opportunity of appealing to the cow, and, therefore, they must be convicted rightly or wrongly?—Not at all. I do not suggest that they should be convicted. They should only be convicted if they are selling milk not up to the standard.

8205. Exactly, but they cannot appeal to the cow?—They cannot appeal to the cow, because they could not trace the cow.

8206. In the other case you say that you do not propose this process should be gone into—of the appeal to the cow—until the analyst has returned to the public authority the result of his analyses; from your knowledge of business matters, or matters of this kind, do you think that the Public Analyst could get the results of his analysis so quickly as to enable the Medical Officer of Health to go down to the cows within two days?—I do, certainly. I do not propose that there should be samples taken in such large numbers that the Public Analyst could not analyse them within 24 hours. The inspectors should be guided in that matter not to take too many. I do not suggest anything impracticable at all.

8207. The number of samples should be reduced?—The number of samples taken in any one day should not be so large in number that they would be beyond the reach of the analyst.

8208. If they were purchased on one day they could not be analysed till the following day, could they?—I do not know; it all depends.

8209. If a Sunday intervened there would be three days' delay?—Yes.

8210. Then if things were done immediately, and the next train caught, do you not see great difficulties in that?—I do not at all; I think it is very simple.

8211. (*Mr. Cowan.*) You said that the supply of milk in the country has greatly increased during the last 20 years?—I believe it has.

8212. May I ask, in your opinion has the quality increased during that time or has it deteriorated?—I am afraid I am not able to judge; I did not know so much of the quality 20 years ago as I do to-day.

8213. Say within the last ten years?—Yes, I think the quality has deteriorated.

8214. Can you give any reason for that?—Yes.

8215. What in your opinion is the cause of it?—My belief is that the cause is low price, and the cause of this low price would be that farmers have been compelled to produce all the milk they can in order to pay their way; they have had to force their milk in order to make up for the deficiency in price.

8216. I have heard it stated that the effect of the large increase in dairying during the last 20 years may account for a good many of the poor results obtained, owing to the inexperience of those entering into that new position; also their poor stocks, also through the land not being suitable and poor feeding, and bad milking; we consider in Scotland there has been a vast increase in those that have taken up dairying now as a farming industry?—Yes.

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8217. Would you suppose that what partly causes the deterioration over the whole milk supply of the country is the fact that they have started dairying in many districts, which are not altogether suited for dairying purposes?—I can quite believe it.

8218. Do you think that would have a tendency towards deterioration?—I am quite sure of it.

8219. In connection with the regular hours of milking, you show, and others have shown, that, of course, there is a great difference in the butter fats got from the morning's milk and those got from the afternoon's milk?—Yes.

8220. You also stated something about the remedy, but you scarcely told us, I think, sufficiently about that. How would you remedy that?—The hours of milking?

8221. Yes. You said that if there was a law passed, in some way or other, that you would act up to that law, and that it could be remedied; how do you propose remedying the results of irregular milking?—If you give me a case in point—an illustration—I will answer the question.

8222. It was your own statement, and we may take notice of that. Cows are milked, say, at regular periods of 16 hours and eight; of course, the eight hours' milking, say, will show perhaps 1·0, or even up to 1·50, I suppose, more butter fat than the morning's milking—at any rate it shows a great deal more, does it not?—It does indeed.

8223. You said—at least I did not quite follow you if you did not—that that could be remedied. How do you propose to do that?—I think I can give you a case that may be in point. I remember once being in Scotland, near Glasgow, where a farmer was producing milk from a very large number of cows for sale in Glasgow. There they commenced to milk at 3 o'clock in the morning; because they had to supply the milk early. On the previous afternoon they commenced milking at 2 o'clock, so that it was really a difference of 13 hours, and 11 hours. There is a case in point; it may be earlier hours or it may be later hours. It is regulating the hours of milking. Then, of course, the question of labour comes in.

8224. As you are aware, in Scotland that is the way we mostly milk our cows at regular intervals, and, of course, we do not show very much difference between the results of morning's and evening's milk?—Precisely.

8225. But then that is only so far as we are concerned. It has been brought in evidence before the Committee that to suit the wants of the consuming public in the large towns farmers are forced to milk at irregular hours, and they must continue that; how would you obviate that?—You cannot obviate it if they are forced to do it. If they are forced to do it they must take the risk.

8226. I thought you could remedy it in some other way, and that you were going to propose by feeding or something else that it would be remedied; but there could be no remedy except milking at regular intervals?—I do not think so.

8227. Do you think feeding has not a very great effect upon the quality of the milk in improving it?—I think under-feeding has; not beyond that.

8228. But you do not think over feeding can improve the quality of the milk above its normal?—Not a jot.

8229. But improper feeding, that is imperfect feeding or improper feeding, as you may call it, deteriorate it?—Unquestionably.

8230. Does it, do you think, deteriorate the normal quality of the fat, or is it through the increased quantity that it gives that it shows less fat?—It is through the increased quantity, that is my belief.

8231. You think that food really has no perceptible effect either one way or the other on the normal quality?—Not on the normal quality.

8232. But of course it is reduced very much through improper feeding?—Yes.

8233. I see that you have condescended on a standard of 12 total solids and 3 of fats?—Yes.

8234. Would you not consider that if that was adopted it would allow of an immense amount of adulteration?—It would allow of some undoubtedly.

8235. But apparently from what you state it would allow of an immense amount of it, because you see there is 3 per cent. of fat, and plenty of people can send in up to 4 and 4·5 of fat; according to what you state 4·1 of fat

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would allow an addition of 33 per cent. of separated milk in order to bring it down to 3 per cent. of fat?—Yes.

8236. In the standard you suggest of 12 per cent. of total solids, not less of it I suppose than 3 per cent. should be fat?—Quite so.

8237. That leaves it open for the bad farmer, or the wicked retailer, to add absolutely 33 per cent. of separated milk to bring it down to the 3 per cent. that would be the legal standard?—I quite admit that; but that would not be my individual view; I prefer 3·25, as I told the Committee, but I do not see how that can be done in face of the great opposition there is in the country.

8238. Do you not think that milk is a thing that can be graded up with proper attention?—I do.

8239. I suppose you would agree that the best farmers have no difficulty whatever in getting 3·25?—I do not know of any case in which they have not got it.

8240. Why should a law be made only to suit those that for reasons which can be got easily over produce a very inferior quality of milk that must go into the hands of the consumer ultimately?—I would rather support 3 per cent. than get nothing at all.

8241. Yes, but then are you right and just in suggesting this 3 per cent.? Later on you suggested 3·25 as being your own individual opinion?—Yes.

8242. Do you think that there is really no difficulty in the milk of this country being brought up to an average of 3·25?—Not in the least.

8243. In fact, it is that just now—it would stand all over the country 3·25 just at present?—I believe it would.

8244. Then you have no doubt whatever, I suppose, that if that was the standard the great majority of farmers, even the very poor farmers, could bring their milk up to 3·25?—Very easily.

8245. Then I do not quite understand why you go in for a standard so low as 3 per cent. of fat. You spoke about the individual farmer testing his milk?—Yes.

8246. I suppose you know just now from your experience that that is not very often done by the farmer?—I do, indeed.

8247. I think you said that it would be possible that he should test his milk every day?—Certainly, I think he should do.

8248. Before sending it away?—Certainly.

8249. If he had 80 or 90 cows, do you think it would be possible for him to do it the same day that he sent it away?—It would not matter if he had a thousand cows.

8250. How can he get an average of all those cows in the morning?—To get an average you would have to take several samples—not each churn. What I should suggest in the case of a large cow owner, is that all the milk should be pooled as it comes from the cooler—it should go into a receptacle, and from the receptacle into the churns.

8251. But we must take in a sense the ordinary farmer?—Yes.

8252. We must take it from his point of view?—Yes, the ordinary farmer would be, I take it, a 25 or 30 cow farmer.

8253. Or 40 cows?—He would be able to take it from his churns.

8254. Would he test every churn?—You can test six samples as easily as you can one, with the exception of a few minutes spent in filling the little bottles. You can test them all together.

8255. Where would the responsibility of the farmer cease in your opinion—and you have had a wide experience of them?—When he delivers his churns at the station.

8256. At the station from his own place, or at the station of delivery?—The station from his own end.

8257. But then he agrees with the middleman, the trader, to deliver it, say, as I do, in Liverpool?—Yes.

8258. If I agree to deliver my milk in Liverpool, I could not ask that my responsibility should cease at my own station; do you not think I would be properly responsible for it till it reached the place where I had agreed to deliver it?—Undoubtedly you would be legally responsible.

8259. At any rate, you would agree that the responsibility of the farmer should at least cease there?—Yes, at least there, but I think it ought to cease at his own station.

8260. We have a difficulty, or at least there is a difficulty in some parts of the country, in the railways allowing our cans to be locked; is that your experience?—No, but I think that matter has been overcome; I think you will find something in the last Journal of the Board of Agriculture dealing with that question.

8261. Some of the companies have, but not all. You see it is hard in that case, for the farmer, if he is not allowed to lock his churn, has to run the risk of losing in transit, has he not?—Yes, he has.

8262. But it is your opinion that the railway companies are now going to allow the churns to be locked?—I think that is so; it appears to be settled.

8263. You seemed to say that you did not think there would be a difficulty in getting the inspector to take a sample of milk within 24 hours after inspection, say, of the milk at the delivery station?—To get it analysed did you mean?

8264. Yes, but as I understood, you said that it would be possible to get the producer in the course of 24 hours?—On the second morning.

8265. That would really be within the 24 hours?—It might be.

8266. If his morning's milk was analysed during the forenoon, and the inspector thought it was suspicious, and the analyst thought it was suspicious, as I understand you, you say that a communication should be made?—What I meant was this—assuming the sample to be taken on a Monday, it would be analysed on the following day, and the cows in the dairy could be examined and milked on the Wednesday morning.

8267. It really could be done on the Tuesday morning, could it not, the earlier the better for the farmer?—I quite admit that, but I am afraid——

8268. Either by communicating by telegraph with the man that was responsible there, the inspector there?—Yes. Mr. Barham's questions to me were just from the other point of view. I think there should be a full day allowed for the examination of the milk by the analyst.

8269. So there is; but what I mean is that if they were suspicious of a man and brought the sample before the analyst they could communicate by wire at once with the responsible party at the place, it may be 150 miles distant to go and see that man's cows, and see them properly milked the next morning?—Yes.

8270. The sooner they could come in contact with the farmer the better?—Yes, that is just the point I raised.

8271. Do you think that would be quite satisfactory to the farmer?—The appeal to the cow?

8272. Yes?—I am only assuming that the milk can be traced to him; I take it that in the vast majority of cases it could not be traced to him.

8273. In this case, you know, where we are speaking of samples being taken by the inspector at the delivery station, of course it could be easily traced to the man?—Yes, but that is quite a different thing.

8274. I am speaking about the producer just now; it is his responsibility I want to get at?—That would be very easy; I did not think of that point.

8275. The difficulty crops up in this way to me. For instance, a man is sending ten cans, as we call them, or churns as you say here, to his buyer in a large town; the inspector only takes a sample from one of those churns, and that owing to circumstances might not be a very correct sample of his milk?—Of the bulk it might not, but it would be a true sample of that particular churn.

8276. But a very incorrect sample of the bulk?—Yes.

8277. Then, when he went to the farmer the next day to see his cows milked, and all that, the cows might absolutely show a very much better sample than the inspector had taken from the churn the previous day, and it would go very hard with the farmer if he did so, and yet he might be perfectly honest?—Quite so.

8278. How do you get over that? The appeal to the cow there is not sufficient, I should think, for the protection of the farmer?—If the farmer's milk from a given number of cows entering into one particular churn is below 3 per cent., then I think there would be a case against him.

8279. But he might be perfectly honest, might he not, and still be caught?—I quite agree.

8280. In dairies such as we have in the part of the country that I come from there may be eight or ten milkers going along at one time; they come with only a part of their milking at a very full time of milk, and they come with, it may be, three-fourth's of the cow's milk. Suppose eight or ten of those milkers come one after the other—with only three-fourths of those, that is a case that might easily occur?—Yes.

8281. That is put over the refrigerator, and it goes into a churn by itself, and shows a very much inferior quality of milk than the next churn would do, where all the better class milk is put in—there is a possibility there?—I quite see the point, but I do not see any injustice to the farmer.

8282. Yes, he will be caught on that, because his cows might not be milked the same way the next day; the only way I see you can get over that——?—The only way would be to pool the milk; to mix it all.

8283. Do you not think the inspector before he brings a farmer up for, very likely, punishment, should take a sample of the whole of his milk—not of a single churn? I want to show that a single churn might be a very poor average of the whole of his milk?—I cannot go so far as that. I do not think so. I think that if a large cattle owner sends out a churn of milk under the standard he should be just as much liable to a fine as the small owner of cows, who sends out a single churn also.

8284. Yes, but I know it for a fact that the milk is sent on to the refrigerator immediately it is drawn from the cow?—Quite so.

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8285. Then it is put into a churn, and the best part of the cow's whose milk has supplied and filled that churn is not there at all—it is in the next churn?—That I quite admit.

8286. That would be an injustice to the honest man; he would be really an honest man, and he might be fined?—Yes, he might, but he has the duty of taking precautions, and in a certain manner it is very easy to do it.

8287. How is that?—By mixing the whole of the milk.

8288. In the case of the man with a large number of cows, it is an utter impossibility to have it all put into one receiver—the process of refrigerating has to go on from the very start to get it away by train, you see?—Yes.

8289. I am putting these things before you, because you have a practical knowledge of them, and I foresee myself that there is a practical difficulty in that unless the man's milk is tested all together?—May I suggest that it is not quite so difficult? Supposing the milk is refrigerated, the cooler should be raised a little higher than it is at the present time. The churn in the usual way is just underneath the refrigerator—a few inches below it, and the milk runs down into it. If that refrigerator cools the milk from the very commencement of the milking, and the milk then passed into a large vat from the whole of the cows, six churns at least could be filled from that vat at one time.

8290. That is not the way it is carried out just now?—No, but it could be done.

8291. It could be?—Very easily indeed.

THIRTEENTH DAY.

Wednesday, 9th May, 1900.

PRESENT:

Lord WENLOCK, G.C.S.I., G.C.I.E. (*Chairman*).

Mr. GEORGE BARHAM.
Mr. GEORGE COWAN.
Major PATRICK GEORGE CRAIGIE.
Mr. S. W. FARMER.
Mr. SHIRLEY F. MURPHY.
Professor T. E. THORPE, F.R.S.
Dr. J. AUGUSTUS VOELCKER.

Mr. R. HENRY REW, *Secretary*.

Mr. HENRY DROOP RICHMOND, called; and Examined.

Mr. H. D. Richmond.

8292. (*Professor Thorpe.*) You are the analyst of the Aylesbury Dairy Company, as we know?—I am.

8293. You have had considerable experience in the analysis of milk?—Yes, I have been employed by the Aylesbury Dairy Company for the last eight years.

8294. You come here, I understand, by invitation of the Committee?—Yes.

8295. Do you in any sense represent the Aylesbury Dairy Company?—Yes. I have been nominated by the directors of the Aylesbury Dairy Company to give evidence on their behalf.

8296. May we take it then that you represent the trade?—As far as the Aylesbury Dairy Company can be taken as representative of the whole trade, I do. I should like to mention, however, that our business is almost exclusively a retail one; so I cannot claim to speak on behalf of the wholesale trade.

8297. The evidence you have to offer is rather from the point of view, I understand, of the milk vendor than from the point of view of the consumer?—Yes, it would be more from the point of view of the milk vendor.

8298. Now, it is your opinion, I understand, that in considering what deficiency of any of the normal constituents of milk shall cause a presumption to be raised that the milk is not genuine, the average amount of those constituents is comparatively of subordinate importance?—Yes.

8299. You think, however, it would certainly raise a strong presumption that the milk was not genuine if the deficiency in any constituent amounted to the greatest found in any sample of milk?—Yes.

8300. Now, you hand in a number of tables showing the results of analyses of a large number of milks from single cows. (*See Appendix* XXIV.)?—Yes.

8301. How many analyses?—There are altogether 6,462.

8302. These analyses, I believe, show solids not fat, and also the amounts of fat?—Yes.

8303. By what methods were these determinations made?—They were practically all made by taking five grammes of milk and drying in a platinum basin to a constant or approximately constant weight; the fat was in most cases calculated from the specific gravity and the total solids, but in some instances, especially in the more extreme instances, were estimated by the coil process of Dr. Adams.

8304. When you say the more extreme cases, do you mean in abnormal cases?—Yes; when the preliminary examination, that is to say, the estimation of total solids and the specific gravity showed that the figures were either high or else low.

8305. Then they were corroborated by direct determinations in the way you have indicated?—Yes.

8306. Are the analytical results obtained by what we may call the approximate methods in your opinion sufficiently accurate to enable us to derive conclusions similar to those which would be derived if a more accurate method had been used?—Yes, they are, in my opinion.

8307. Can you give us any idea, for example, what is the order of disparity between what I might call approximate methods and those which would be more rigorously employed, say, in a prosecution case?—I have some

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figures on that point in Table 5. These show the difference between the fat estimations by centrifugal methods and gravimetric analysis. The percentage of samples in which the difference was 0·1 per cent. or under was 84·2; in which it was from 0·1 to 0·15 the percentage was 10·8; from 0·15 to 0·2 the percentage was 4·4; and over 0·2 the percentage was 0·7. Then, I also give a similar table for the differences between the fat estimated by gravimetric analysis and fat calculated from the total solids and specific gravity. There the difference was 0·1 per cent. or under in 67·3 per cent. of the total cases; 0·1 per cent. to 0·15 per cent. in 19·6 per cent. of the total cases; 0·15 per cent. to 0·2 per cent. in 10 per cent. of the total cases; and was over 0·2 per cent. in 3·2 per cent. of the total cases. Then I have also for comparison shown the difference between the fat estimated by gravimetric analysis by two different analysts on samples which have been divided into three parts. There the difference is 0·1 per cent. or under in 56·4 per cent. of the samples; 0·1 per cent. to 0·15 per cent. in 19·5 per cent. of the samples; 0·15 per cent. to 0·2 per cent. in 15·5 per cent. of the samples; and it is over 0·2 per cent. in 10·4 per cent. of the samples. The agreement between the fat estimated by gravimetric analysis, which I may call the more exact method, and the other, which I may call the approximate method, is thus within the differences found by two different analysts working independently of samples, which are not the same, but which are portions of the same sample.

8308. Are the differences constant in direction?—No, they sometimes lie in one direction and sometimes in the other. Speaking roughly, they are about equal.

8309. Then there is no inherent error in what I may call the approximate method?—No.

8310. Now, therefore, you think from the results of this large number of analyses that it would be impossible to adopt figures for the limits from the extreme cases?—From the milk of single cows?

8311. Yes?—I think so. I would point out that the greatest deficiency in the percentage of solids not fat in the milk of a single cow was 4·9 per cent., and in the fat in the milk of a single cow it was 1·0 per cent.

8312. You think, therefore, that whatever limits may be suggested should be based upon the results of mixed milk?—Yes, I think they should.

8313. Now, you have taken the trouble to give us some what I may call actuarial calculations of the results of your analyses?—Yes.

8314. But instead of taking the results of individual cows as the basis of these calculations you have preferred to take the results obtained from the churns?—Yes.

8315. In other words, you have used the churn as the unit?—Yes.

8316. And not the milk of an individual cow?—No.

8317. Would you kindly explain to the Committee why you have done this and what are the limitations to its use?—The reason that I have taken the churn as the unit is because it is usual to send milk from farms to the dairy in the churn, which is a vessel that holds 17 gallons or under. As practically all milk which passes into the milk trade is sent in churns I think it would be fair to take that as the unit. I have felt unable to take the percentage found in an individual churn, especially in the fat as the standard, because it sometimes happens after the churns have been filled that a portion of the milk is taken out, and the portion which is taken out may contain a good deal of the cream, and that cream may be put into some other churn, so that you may have two churns which contained the same milk to start with, but after the quantities have been altered (for instance, to make the quantities more equal) the quality is also altered; and, therefore, I think that it is not right to take the absolute minimum observed, because that may not be representative of the quality of the milk; it may be fictitiously low. I have some examples of churns in which that has taken place. For instance, in Table 7 there were three churns received from a farm in March 1894; in the first churn the percentage of fat was 6·75, in the second churn it was 1·70, and in the third it was 2·40. If one takes the average quality of the whole of that milk it will be seen that it is very fair milk; but the first churn is abnormally high in fat and the other two are abnormally low. I think it is advisable to exclude those abnormally high and abnormally low samples.

8318. I should like to ask, with respect to that, is this a condition of things which is very likely frequently to occur?—No, I cannot say it is likely to occur very frequently. It happens, perhaps, once in six months, or perhaps less often than that.

8319. Once in six months?—Yes, when there are these extreme variations.

8320. You are speaking, of course, of the experience of your own company?—Yes, entirely.

8321. Once in six months over a constant delivery such as you have cannot have any effect whatever, surely, upon the results?—No, it has no effect, but I mention that it was necessary to exclude these in order to arrive at a result which would be fair and justifiable.

8322. (*Chairman.*) But you do not suggest that a standard should be fixed which would cover such sorts of accidents as those?—No, I do not suggest that for a moment; on the contrary, I was suggesting that these accidents should be excluded.

8323. We cannot take them into consideration, in point of fact?—No, they are not to be taken into consideration.

8324. (*Professor Thorpe.*) Would they be excluded, or could they be excluded by more care or some difference in the mode of procedure which is perfectly practicable on the part of the farmer?—Yes, I think the whole of these cases could be excluded; they are certainly due to carelessness on the part of one of the employees.

8325. In that case of course we need not take them into consideration?—No.

8326. That being so, and you having told us what is the experimental value, so to say, to be attached to the particular mode by which you obtain the results, would you kindly explain to us precisely what is the inference you draw from the mathematical treatment you have given to your results?—Perhaps the best way of doing that would be to explain how I obtained this formula. This formula is derived from the ordinary method of calculating probable error. The formula for calculating probable error is just the same as the formula I have given, only instead of the constant being the same it is a constant of 0·6745. That is accepted, and it can be shown mathematically that it gives the point at which it is probable that an equal number of results lie within and without that.

8327. (*Mr. Barham.*) Is this formula the same as that used by your sliding scale?—No.

8328. Is it the formula that you describe here as being the Hehner-Richmond formula?—No, it is not that. This is a formula for calculating out the probable deviation from the mean results of any particular churn.

8329. It is not a formula you have used to ascertain the results that you show us in these tables?—No.

8330. (*Professor Thorpe.*) I think perhaps you had better make that quite clear; this is really a variation upon a well-known mathematical treatment for obtaining the probable error attaching to any one result from a series?—Yes.

8331. It is simply a variant upon a well-established mathematical expression for obtaining that probable error?—Yes. Then having obtained the probable error—in this case it is not correct to call it the probable error, and I have called it the probable deviation from the mean—I have proceeded on the assumption that as one gets farther away from the mean the samples are more unlikely to occur in proportion to the distance from the mean.

8332. In a certain proportion?—Yes.

8333. Do not say in proportion, because you have it not in direct proportion, but in a certain proportion?—Yes. In order to get the probable extreme limit to which a sample may be reasonably expected to go, I have multiplied the constant in that formula with the sum of the series, $1 + 1 + \frac{1}{2} + (\frac{1}{2})^2 + (\frac{1}{2})^3$ to infinity; the value of that is 2·99997, or practically 3. When that is multiplied by the constant in the formula, which is 0·6745, it comes to practically 2·0—in reality it is 2·022, but as the decimals will not affect the results I have left those out, and given the round figure of 2.

8334. Having explained how you have arrived at the expression, would you kindly tell us now what it points to when you treat the whole of your results derived from churns?—I have given in table 3 the results obtained by treating the whole of the analyses of the churns from the year 1894 to the year 1899.

8335. (*Mr. Barham.*) Single churns?—Yes. I have given the probable deviations of the mean, which is obtained from the usual formula for calculating probable error; then I have given also the standard which is obtained by subtracting from the arithmetic mean the figure obtained by this other formula; and I have given that for each month in the year, both for the solids not fat and for the fat. Speaking broadly, these figures show that on the whole the standards of the Society of Public Analysts, namely, 3 per cent. and 8·5 per cent., are reasonable, that is to say, in the bulk of the cases the calculated standards lie on or above that. To take the case of the standard for fat first, it would show that practically speaking the only times at which it falls below the standard of the Society of Public Analysts is in the months of May and June; there there is a constant tendency all through the years examined for this standard calculated by the formula to fall below 3; the lowest figure it has fallen to is 2·84.

8336. (*Professor Thorpe.*) Are you now summarising the general results of the whole of the years, or of any particular year?—Of the whole six years.

8337. Let us get this clearly on the notes if you please; the teaching of the experience of one year is substantially confirmed by the experience of the subsequent years?—Yes, that is so.

8338. (*Mr. Barham.*) You are now referring to table 3, are you?—Yes, tables 3—A to F. (*Appendix* XXIV.)

8339. (*Professor Thorpe.*) It would appear from these tables then that the only times of the year in which the standard of fat is below 3 per cent. are about two months of the year?—Yes.

8340. Namely, April and May?—Yes.

8341. Is it always in the same months?—There is one small exception in 1894, where it comes just below, in February, March, and April, but it is so close to that that we may practically take it as 3.

8342. Let us be quite clear what months in the year it is below 3?—In the whole of the six years it has fallen below 3 per cent. in May and June.

8343. Now, during the rest of the year it is above 3 per cent., and in some months considerably above 3 per cent.?—Yes, in September, October, November, and December. I think those months may be taken as the highest months. There it is always considerably above 3 per cent.

8344. And that obtains throughout the entire six years?—That obtains throughout the whole series.

8345. In considering what factors should be taken as limits upon which to determine or upon which to raise the presumption that a sample is not genuine, do you attach an equal importance to the two factors, fats and non-fats?—No, I attach far more importance to the fat than to the solids not fat, because by further examination of the constituents of the solids not fat one can obtain information which is not given by the percentage of the solids not fat alone. One cannot, on the other hand, at least at the present time, by further examining the fat obtain any more information than is given by the absolute quantity of fat. Therefore I think that it is not necessary to pay so much attention to the standard of the solids not fat as to the standard of the fat. I would point out here that there is a general tendency in the whole of the six years for the calculated standard for the solids not fat to fall during the months of July and August, and sometimes September, lower than the standard which is calculated for solids not fat for the other months.

8346. (*Chairman.*) The year 1894 shows very different results on this particular point to the results in all the other years; can you explain that; February, March, April, and July are the weakest months for the solids not fat?—I am afraid I cannot offer any explanation of that fact.

8347. (*Mr. Barham.*) Were these analyses made by you or Dr. Vieth?—The whole of these analyses were made by me.

8348. (*Major Craigie.*) The same feature applies to 1898, does it not?—Yes.

8349. (*Chairman.*) In fact nine months out of the 12 they are below 8·50 of solids not fat?—Yes; I cannot offer any explanation of that fact.*

8350. That is the milk supplied to the Aylesbury Dairy Co.?—Yes.

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8351. If there were a legal standard of 8·50 of solids not fat they would on those particular occasions have found themselves liable to be called on to explain?—Yes.

8352. (*Professor Thorpe.*) Are you prepared at this stage to offer any suggestions to the Committee as to what might be reasonable limits to be adopted, and how the definition of those limits should be framed?—I think before I do that I would like to put in Table 4 A—F. ((*See Appendix* XXIV.) Those figures show the highest and lowest percentage of fat in milk sent out by our company on each day from the 1st January, 1894, to the 31st December, 1899, and are a continuation of the tables laid before the Food Products Adulteration Committee in 1894. At the bottom of the table I have summarised the results, giving the maximum during the month and the minimum during the month. I would like to say that, speaking broadly, the variation of the minimum is of the same order as the variation of the calculated standards; that is to say, that on the whole the lowest results are obtained in May and June, and the highest results are obtained in September, October, November, and December. On these tables, I think I would offer a recommendation to the Committee, first of all that in the winter months the standard should be raised from that usually adopted—that is to say, in the winter months the standard should be higher than 3 per cent.

8353. This is important; your suggestion is that there should be no fixed standard throughout the year?—Yes, that is so.

8354. But that there should be a variable standard depending upon the season?—Yes.

8355. Perhaps you will kindly explain to us what are the respective times of the year that you suggest, and when they should change?—If we take first of all the two months in which the fat is low—in May and June—I think that in those months the standard certainly should not be higher than 3·0; it might, I think, without a great deal of harm being done to the interests of the consumer be a little bit under 3·0; I do not suggest that it should go under 2·8 at the very outside, but only in those two months do I think it should be less than 3. In the winter months—September, October, November, and December—I think it should be higher than 3·0, and I do not think any great hardship would be imposed on the vendors by making it as high as 3·2 or 3·25. I do not think I can recommend a standard higher than that.

8356. (*Mr. Barham.*) 3·2 and 3·25 are not quite the same. Which do you suggest?—I think, for all practical purposes, the two are the same. It is a matter of convenience, I think. 3·25 is halfway between 3·5 and 3·0, and it is convenient in that respect. I think, on the whole, it is convenient only to take one place of decimals, therefore I think 3·2 would be the best if expressed in decimals, but 3¼ is perhaps a round figure.

8357. (*Chairman.*) Take Table 4A, which you have been explaining to us, it shows that during the year 1894 the lowest to which the fat fell was 3·10 in February and in May?—Yes.

8358. Then in Table 3A, which deals with the same year, the average of a good many months is much below 3·10. I do not quite follow that?—I should like to point out first of all that these two tables are entirely independent. They are not calculated in the same way. Table 3 is calculated by means of a mathematical formula from the composition of the milk received by the Aylesbury Dairy Company from the results of individual churns; Table 4 gives the maximum and minimum of the milk which is sent out to their customers by the Aylesbury Dairy Company. Therefore, although one may expect a general correspondence of the two tables, one cannot expect that in every individual instance the same results will be given. The two tables are derived from series of analyses which are quite distinct. Perhaps if I explain briefly how the milk is treated it will assist in showing the differences. The milk comes in from the country to our chief dairy and branch dairies, and there a sample is taken from each individual churn of milk which the farmers send up. A certain number of those samples are examined and the fat estimated. It is from those results that Table 3 is calculated. Then, when the milk has come into the dairy, it is mixed, in order to guard against any difference in the churns, and then it is put into other vessels and sent out to the customers.

8359. (*Mr. Barham.*) When you say it is mixed, do you mean that the several churns coming from one farmer

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* The witness subsequently wrote: "A subsequent consideration of the figures leads me to the conclusion that the low solids, not fat, in 1894 and 1898, and January 1899, were due, to some extent, to the effects of drought in 1893 and 1898."

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are mixed, or that the milk of different farms is mixed?—Sometimes it is the one, sometimes it is the other. It depends on the quantities.

8360. The extent of the mixing would be three churns or four churns or 20 churns or 50 churns?—It might be 10 or 20; it might, on the other hand, be only three. The milk is mixed and transferred to other vessels, in which it is sent out to supply the customers. A sample of each of those is taken before being sent out, and the fats estimated on that. From the results of that second series Table 4 is calculated. Table 3 shows the results obtained from the milk as it comes in, and there is in Table 3 a certain influence which I have pointed out before—namely, the milk in the churns arriving from the farm not being equally mixed. In Table 4 that influence has been removed to a very large extent, the churns having been mixed at our dairy. The two series do not correspond necessarily with exactitude, though, as one would expect, we find also that there is a general indication of the results tending in the same direction—that is to say, where the standard calculated is high the actual minimum which is sent out is also high, and where the standard calculated is low the actual minimum sent out is low.

8361. (*Professor Thorpe.*) I quite see how this arises. In Table 3 you will have to deal, for the reasons you have given us, with wider variations than you have to deal with in Table 4?—Yes.

8362. In Table 4, by the practice of your company, you equalise the differences which have been brought about by carelessness or by some other cause on the part of the farmers?—Yes.

8363. The net upshot of that is that you by that system bring about a greater equality in the composition of the milk as delivered throughout the year than if you simply handed on the churns as received from the farmers?—Yes.

8364. May I point out to you that the effect of that is to very considerably minimise the occasions, or the number of occasions, upon which the milk will go down even to the limit of 3 per cent. of fat?—Yes, that is so.

8365. In general, then, the Aylesbury Dairy Company over the whole year does very infrequently deliver milk with so low a quantity of fat as 3 per cent?—Yes.

8366. You have, of course, with your farmers certain contracts, have you not?—Yes.

8367. In those contracts you specify for a certain minimum amount of fat, do you not?—Yes.

8368. What is the amount you so specify?—3·25.

8369. Do you make a variable standard throughout the year?—No, we have only one form of contract.

8370. Do you find any difficulty in the farmers conforming to the terms of that contract in these months of May and June?—Yes. In the months of May and June we have a large number of the farmers supplying milk, which falls below that; for instance, I may say, that about half the samples of morning milk examined yesterday were below the contract quality.

8371. What do you do in such a case as that?—As a rule on the first occasion on which the milk falls below nothing is done; on the next occasion the farmer is advised of the fact, and we should continue to advise him of the fact if it kept low. I do not say we should advise him of every sample, but we should advise him at least once a week.

8372. What do you expect to follow from thus advising him?—In a large number of cases the farmer is able to find out some cause for the milk falling below that; I will not say in all, for it is certainly not by any means in all cases; but in some cases we find out that he has run short of food, and his cows for a short period have been insufficiently fed.

8373. Even during those months?—Yes.

8374. Surely food is plentiful enough at this time of the year, is it not?—I can only speak from the letters which we receive in reply to our letters advising the farmer. The chief thing is that they have fallen short of cake—that is to say, cotton cake, as a rule.

8375. They hoped, in fact, I suppose that the fresh green food would enable them to get over the difficulty, is that it?—Yes; I have seen that stated in some of the farmers' letters.

8376. Is it your general experience that these remonstrances with the farmer have had the effect that you had hoped as a company they would have had in raising the standard of the milk?—In some cases, but not, I think, as a general rule, during May or June.

8377. Not as a general rule?—Not in the majority of cases.

8378. Are you in a position to tell us under the operations of your contract with a limit of 3·25, what is the general amount of fat over the year that you succeed in getting?—I can give you the average amount for the past six years. In 1894 it was 3·86 per cent.; in 1895, 3·84; in 1896, 3·81; in 1897, 3·82; in 1898, 3·83; and in 1899, 3·74.

8379. Then, we may take it, that the general result is that you, in the greater number of cases, succeed in getting 3·8 per cent. of fat?—Yes.

8380. In the greater number of the years the amount has been above 3·8?—Yes.

8381. Have you exhausted all you wish to say as to the recommendations you have made as to the fixing of limits?—I think I have said that in the winter months, September, October, November, and December, I would recommend the standard being raised to the round figure of 3¼ per cent.; I think that is the most convenient. In the months of May and June, I think the standard should either be kept at 3, or it might be put down a little bit; I think to put it down to the round figure of 2¾ per cent. is putting it down rather more than is necessary; but seeing that during those months the price of milk is low, and the supply is plentiful, and consequently there is not as much temptation to adulterate as when the price of milk is high, and it is scarce, I do not think that a great deal of harm would be done even by having it as low as that. For the rest of the year I would recommend a standard of 3 per cent.

8382. I suppose in those months that you speak of when milk is plentiful—because, I suppose, it is most plentiful at those particular times of the year, when it is rather low in quality, is it not?—Yes, speaking broadly.

8383. Speaking broadly, it is most plentiful at a time of the year when the amount of fat is low?—Yes.

8384. The price is then lowest, is it not?—Yes.

8385. Would there be any difficulty in a farmer complying with the standard by separating a small portion or a relatively small portion of the fore milk of the cow?—I am afraid I cannot say that. The farmer has to work very often under very strict conditions of time, and anything which takes him a little bit longer than his usual plan would perhaps be impracticable. Except for that difficulty I have no doubt it could be done.

8386. Those conditions surely, if they be irksome, are least irksome at a time when the days are longest, are they not?—I am afraid I am not sufficiently acquainted with the conditions under which the business is carried on at a farm to give you any real information on that point.

8387. What suggestions have you to offer to the Committee to obviate the difficulties which are raised by the fact that the evening and the morning milk are slightly different in composition?—I hardly see how that can be obviated because the evening milk is not sold in the evening exclusively, nor the morning milk in the morning exclusively. As a rule, it is just the other way about in London; the morning milk is sold in the afternoon, and the evening milk is sold early next morning; as a general rule, but it is by no means an exclusive rule.

8388. The point, of course, is this, that in fixing any limits, inasmuch as the analyst would never know whether he was dealing with one kind of milk or the other, I suppose in justice, and giving the person incriminated the benefit of all reasonable doubt, we should have to fix our limits with respect to morning milk?—Yes; as a matter of fact to all practical purposes these results which I have handed in are based on morning milk. Although I have not excluded the evening milk the influence of the evening milk is completely overborne by the influence of the morning milk on the results.

8389. (*Mr. Farmer.*) Does that apply to Table 4?—Yes, because I believe that the whole of the minimum results in Table 4 are obtained from morning milk.

8390. Does it apply to the maximum results in Table 4?—The maximum results are probably all

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obtained from evening milk. I would not like to say that they actually all are, but practically that is what it is. The maximum result is the maximum evening result, the minimum result is the minimum morning result.

8391. (*Professor Thorpe.*) This is important. Your opinion is that the tendency of this Table is rather in the direction of giving the composition of morning milk than of evening milk?—The tendency is that the standards deduced from these tables are deduced more from the composition of morning milk than from the composition of evening milk.

8392. (*Mr. Farmer.*) Do you analyse what you send out in the morning, as well as what you send out in the evening?—Yes, the whole thing.

8393. Consequently Table 3 shows us the whole of your deliveries?—The whole of the milk received by us.

8394. Table 4 shows that which is sent out by you?—Yes, Table 4 gives the whole of the milk sent out by us.

8395. (*Professor Thorpe.*) You will have something, I think, to tell the Committee as to your opinion on the advisability of defining a method by which the presumption should be raised?—Yes. In talking of the percentage of fat and the percentage of solids not fat, we do not actually mean fat and solids not fat, but we mean figures deduced in a certain way. All methods of analysis have what is called experimental errors. For instance, take the case of the fat; that is usually estimated in an exact method of analysis by extraction with ether. In milk there are other substances besides in small amounts, which are more or less soluble under certain conditions in ether; and according to the exact way in which the milk is treated, the ether may extract the whole of the fat with comparatively small quantities of other constituents, or the whole of the fat with comparatively large quantities of other constituents. Then also in milk it is not very easy to extract the whole of the fat unless certain precautions are taken, such as spreading the milk over a very large surface, so that the whole of it can be attacked by the ether. Unless one takes the necessary precautions a small amount of fat may be left behind. So that the figure which may be arrived at is made up of an estimation of the fat, more or less complete, plus an estimation of small quantities of other substances. Unless the method is always worked under exactly the same conditions, the errors in the hands of different analysts may fall on one side or the other, and the estimation of the fat in the hands of one man may differ from the estimation of the fat in the hands of some other man. The same thing also applies to the estimation of the total solids in milk, in fact, to the whole of the constituents.

8396. Of course; it only enters into the question of the determination of the total solids in so far as the determination of the total solids is done by difference?—Yes.

8397. Whatever error is caused by the estimation of fat is incidentally thrown upon the determination of the total solids?—Yes.

8398. That is assuming those total solids are properly determined?—Yes.

8399. What have you to suggest?—I have to suggest that some means should be taken to ensure the same method being used by all people. I think that is hardly a question which can be discussed here; in fact, it is not a question to be discussed at all; it is a question to be worked out in the laboratory—what are the extent of the experimental errors and how they can best be obviated.

8400. What does your suggestion amount to—that the Board of Agriculture or some other authority should prescribe methods to be used?—I should think that the best thing which could be done—I do not know whether my suggestion is practicable or even in order—but I should suggest that it would be advisable if a committee of analysts could be nominated to investigate the best method. The committee, of course, would include Professor Thorpe as head of the Government Laboratory, and I would suggest that it should include some members at least of the Society of Public Analysts, which represents not only the public analysts of the kingdom, but practically the whole of the analysts in practice in the kingdom. I might mention that there is a precedent for such an inquiry—I believe I am in order in mentioning this—because a correspondence has passed between Professor Thorpe and the Council of the Society of Public Analysts with regard to the methods of determining the percentage of butter in margarine, and actual experimental work has been carried out in various laboratories in consequence. I think if something the same sort of thing could be done with regard to the best methods, or the methods which give the most exact results in milk analyses, a method could be devised, and perhaps afterwards made an official method.

8401. I do not wish to comment on that suggestion; it has many things in it which commend themselves to me, but I think perhaps you ought to inform the Committee or give them some idea with the view of letting them know the precise significance of the suggestion what in your opinion is the order of discrepancy between the methods which are actually in use by analysts?—In Table 5 (*Appendix* XXIV.) I have in the last paragraph shown the differences between analysts on samples which have been divided into three parts. There it is shown that in 56·4 per cent. of the samples the difference is 0·1 per cent. or under, while in 10·4 per cent. of the samples the difference is over 0·2 per cent. Then I have in Table 6 some figures which show the analyses of nine samples of milk made by three different analysts. The reason I have chosen these nine samples, which is a very small number, is because they happen to have been analysed not only by three different analysts, but by a considerable number of different methods. In the first part of the table I have summarised the results to show the difference between the various methods of analysis. To take the total solids first, the mean percentage of the whole of the nine samples given by the method of the Society of Public Analysts is 12·58 per cent. The Society of Public Analysts' method I may say, consists in drying five grammes of milk in a basin on the waterbath, and then continuing the drying in the water oven till the weight is approximately constant—that is to say, till it is less than one milligramme per hour. By the method of using asbestos, that is to say the method by which the basin, instead of being used alone, is packed with asbestos, and the milk is dried on the asbestos in order to expose the largest surface, the mean result is 12·61. By the Somerset House method, that is to say the method described in Dr. Bell's work on foods, the mean result of the total solids is 12·72. This figure of total solids, I may say, is obtained by adding together the figure for the fat and the figure for the solids not fat, which were each estimated. Then taking the question of the fat, taking the coil method devised by Dr. Adams, and using dry ether, we found 3·76 per cent. as a mean, and commercial ether gave us 3·78. The Werner Schmidt method gave us 3·88; the Somerset House method gave us 3·77, and the centrifugal method gave us 3·72. I have also put down "Centrifugal (R)," which includes the results I actually obtained. The reason I put that in is because the results under this heading are comparable with the results which have been used in determining Tables 3 and 4.

8402. You mean it is the Leffmann-Beam method?—Yes.

8403. The other centrifugal method being what?—That is also the Leffmann-Beam method, but in the hands of other analysts. But as it was my own work, and these tables were my own work too, I put that in to show you how the figures in these tables compared with the figures obtained by the gravimetric analysis. The solids not fat estimated directly by the Somerset House method came to 8·95 per cent.; that calculated from the Society of Public Analysts' method for total solids estimation, and the Adams' method using commercial ether, came to 8·8 per cent.; that calculated from the Society of Public Analysts' method and the Werner Schmidt method came to 8·7 per cent.; that calculated from the Asbestos method and the Adams' method using dry ether came to 8·87 per cent.; and that calculated by the formula of Hehner and myself, which has been used in Table 3 to calculate the solids not fat, came to 8·61 per cent.

8404. When you speak of the Somerset House method, were those done by Somerset House?—No, they were done by the three analysts who took part in this research. I have the permission of the other analysts to mention their names; they were Mr. Bevan, Mr. Hehner, and myself. We worked according to the directions given by Dr. Bell in his book.

8405. Have you got the individual results there of the three analysts?—Yes, I have the whole of the individual results; shall I read these out?

8406. Let us deal with the final result. It would appear from these tables that Somerset House, as regards

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fat, gets substantially the mean results of a series of numbers given by different observations, does it not?—Yes, the Somerset House results practically agree with the rsults by the Adams method.

8407. And the Somerset House method compensates for the difference between the Werner Schmidt method and the two centrifugal methods, does it not—it is somewhat midway between those two?—Yes, it is.

8408. In other words, therefore, assuming that these several methods are of equal weight as analytical determinations, Somerset House gives a result which is approximately near the truth?—Yes, that is so.

8409. Wherein apparently the Somerset House determination differs from the others is in the direct determination of the aggregate amount?—Do you mean in the total solids?

8410. Yes; it would seem to give a slightly higher result than the others?—Yes.

8411. But the Somerset House system of all these is the only one which directly determines the solids not fat?—It is the only one which gives a figure for the solids not fat, but I hardly like to say it directly determines the solids not fat.

8412. Why does it not directly determine them?—The reason for that is based on some experiments which were made with solutions of milk sugar. As you know, of course, milk sugar is obtained in two modifications—with and without a molecule of the water of crystallisation. If you take a solution of milk sugar, and treat it exactly according to the Somerset House method of milk analysis, you get a residue of milk sugar, which you may take as solids not fat, and you will find that that residue corresponds neither with the weight which is calculated with the molecule of water of crystallisation, or calculated without the water of crystallisation. It lies in between the two, according to my experience. Sometimes it approaches a little more to the one, and sometimes a little more to the other. Therefore I think that the solids not fat obtained by the Somerset House method include a varying amount of water of crystallisation in the milk sugar—they do not contain the whole of it—while I think the results obtained by the other methods are expressed in terms of milk sugar, free from the water of crystallisation.

8413. How does that necessarily obtain, because all the other methods which directly determine the aggregate solids do so by evaporation to dryness of a weighed quantity of the milk, and heating that weighed residue for a certain length of time, till it is assumed to have lost its water?—Yes.

8414. How is the water then more easily parted with in the presence of the fat than it is in the absence of the fat?—The ease with which the milk sugar parts with its water of crystallisation is independent of the presence or absence of fat, but it depends on the way in which the evaporation is conducted. If you take a solution of milk sugar in water, and evaporate it to dryness without interruption, it will lose the whole of its water of crystallisation, and you will obtain anhydrous milk sugar. If, on the other hand, you evaporate it down till the solution has obtained the consistency of a thick syrup, and then add ether to it, as is done in the Somerset House method, the milk sugar becomes solid, and it is precipitated partly in the hydrated modification and partly in the anhydrous modification. Now, if you dry on the water bath, or in the water oven, a sample of hydrated milk sugar it will remain hydrated; it will not lose its water of crystallisation until a temperature about 130 degrees is reached, so that by the Somerset House method the milk sugar having been once precipitated by ether in the form of the hydrated modification, or partly in the form of the hydrated modification, it retains on the water bath, and in the water oven that water of crystallisation. That is how I think the difference between the two methods is accounted for.

8415. Are you aware that milk sugar will part with its water of crystallisation at a very much lower temperature than 100 degrees if the heating is done under a reduced pressure?—Yes, I have found that if you take a solution of milk sugar, and evaporate it in vacuo over sulphuric acid, you can obtain anhydrous milk sugar.

8416. Would you be surprised to learn that direct determinations of the influence of the water so retained by milk sugar have been made by Somerset House, and as could be shown to you directly, no matter whether you evaporate at 100 degrees under reduced pressure, or at 100 degrees under the ordinary pressure of the air, the results of a given quantity of milk sugar are the same?—That is, I may take it, if you take a solution of milk sugar, and evaporate it direct, without interruption.

8417. When you have the effect of the water exerting its maximum action?—Yes. I should not be at all surprised to learn that; in fact that would be in accord with my own observation.

8418. Would you be further surprised to learn that when that milk sugar is mixed with casein precisely the same results follow?—No.

8419. Would you be further surprised to learn that when that milk sugar is mixed with casein plus fat the same result follows?—No.

8420. Then what is the influence of the water upon the determination of the milk sugar?—If the evaporation is interrupted, and ether is added which precipitates milk sugar in the solid form partly as an hydrated milk sugar, and partly as an anhydrous milk sugar, the water of crystallisation is not then lost on drying it at 100 degrees.

8421. In all the three cases I have mentioned to you, water was present, the effect of each single thing was studied, the effect of the addition of the other constituents of the milk along with that was studied, and yet the results showed, as we shall be able to prove to the Committee, that the alleged action did not occur?—May I ask if the milks were treated in exactly the same method as the Somerset House method of milk analysis; that is to say, when they attained the syrup consistency there was an addition of ether made?

8422. Eventually, of course, they were treated?—Before being evaporated to dryness?

8423. The ether was added before the thing was wholly dried, if that is what you mean?—Yes, I mean that. I may say that my observations when that is the case have not been in accord with that fact.

8424. This is rather important to us; may I ask what is the particular significance you attach to the second place of decimals throughout the whole series of your tables?—The second place of analysis is not an exact figure. Our methods of analysis I do not think are sufficient to give us accuracy to the second place of decimals; but it is usual, however, to express them in two places.

8425. You think yourself, may I venture to say, as an analyst knowing what these methods are, that the second place of decimals has no practical significance?—That is so.

8426. You might have returned these results as 12·6, 12·6, 12·7, and so on respectively?—Yes.

8427. And they would have been substantially accurately expressing what was obtained?—Yes.

8428. Precisely here, too, we might have the fats returned as 3·8, 3·8, 3·9, 3·8, 3·7, 3·7, and so on?—Yes.

8429. In other words, I think, therefore, you may say that all the results, no matter how obtained, are accurate to the first place of decimals?—Yes, I should say so.

8430. The variation is not great, and they are all accurate to the first place of decimals?—Yes.

8431. That is a degree of accuracy I should assume which is enough for practical purposes, is it not?—Yes. I should like to point out, however, that in the consideration of these we have been taking the mean results of nine samples, and consequently the variations would be very much smoothed down.

8432. They would be less, no doubt, but still even here they only show that the second decimal place is much more negligable than you would lead us to infer, and that in point of fact the errors are in the first place of decimals?—Taking the individual results?

8433. Yes; no two analysts can get their results accurate within the first place of decimals?—Two analysts, unless they use absolutely the same methods, and under the same conditions, I do not think can depend upon agreeing upon the first place of decimals.

8434. But they have used the same method under the same conditions?—I should like to point out that although one uses the method which is called the Adams method, or the Somerset House method, or the Werner-Schmidt method, that does not necessarily mean that the conditions are absolutely the same.

8435. You mean there is the personal equation, as you would call it?—There is the personal equation.

8436. I suppose the personal equation would still remain whatever the Board of Agriculture did with respect to these suggestions?—I think the personal equation is largely a question of exact conditions, and if the conditions

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are laid down more exactly the personal equation would become less.

8437. In other words, they assume they work the same methods, but they do not all work the methods in the same way?—I think that is so.

8438. Your suggestion in view of getting some official prescription of a method is directed to removing these comparatively small inequalities?—Yes.

8439. But the inequalities such as they are are worthless—not sufficient to affect substantially the direction of justice?—Not these inequalities, but I do not think the ones shown here are as high as those which are sometimes, or may sometimes, be obtained; for instance, one occasionally hears reports of cases in the police court, where there has been a difference of 0·3 or 0·4 per cent. between the public analysts and the analyst for the defence. A difference of that character means that the same conclusions would not be drawn from the results. It is more to correct these larger differences than the differences shown by the averages here.

8440. I suppose nowadays all cases are fought out by the aid of methods which are generally accepted by analysts as reasonably sufficient, are they not; analysts are in substantial agreement, that is; they may not all use precisely the same methods, but they all of them use methods of the character here indicated?—Yes, I think fairly so.

8441. You can fairly say that?—Yes.

8442. Is it not the fact, however, that inequalities in the conditions under which samples are taken are of much greater importance than differences introduced by diversity of methods such as are here given?—Yes. I presume you refer to the fact that when milk is sent out for delivery to customers in a vessel, and no means are taken to keep the cream mixed, then the variations in the cream will be far larger than the variations between different analysts?

8443. That is one thing I have referred to; that is a fact, is it not?—It is a fact.

8444. It is also a fact that the same influence is at work, although I will not admit, of course, for a moment, to the same degree, even in the partition of the samples into three parts?—Yes, it is.

8445. You are dealing, therefore, with much wider discrepancies, or possible discrepancies, there than you are in the variations of the methods which you use?—Yes.

8446. What have you to tell us on the subject of cream and condensed milk?—To take first the subject of cream, I would like to point out that the term cream is a fairly wide and elastic one. It consists of a product obtained by at least three systems. The first is the centrifugal system, in which advantage is taken of centrifugal force to remove the fat; the fat of milk is lighter than the other constituents, and can be removed almost completely from the milk in that way. The second is the setting system, in which the milk is placed at rest in pans, or other vessels, and the cream rises to the surface, and is skimmed off. The third is the Cornish, or scalding system, in which the milk is allowed to stand some time, and then it is placed on the fire, and gradually heated up almost to the boiling point, and then it is allowed to cool, and the cream which rises to the top under those circumstances is skimmed off.

8447. Having described the several methods in which cream is obtained, what have you to suggest as to the prescription of any standards?—I hardly think that a standard which is applicable to one of those classes would be applicable to the others. For instance, if cream is prepared by a separator which does its work very efficiently indeed, and removes the whole, or practically the whole of the fat from the milk, one may expect to get 50 to 55 per cent. of fat in the cream. If, however, the separator is not working efficiently, and is not working under conditions in which perfect separation is obtained—that is to say, if the milk is not warmed up to the most favourable degree, it will contain less fat, and may lie between 40 and 50 per cent. If the cream is obtained by the setting system in shallow pans, and the milk is allowed to stand for 12 hours or so with the surface exposed, you may get cream containing about 30 per cent. of fat; if you have the deep setting system, in which the cream is set in deep vessels, it will contain even less fat than the shallow setting system. Speaking broadly, and under certain conditions, the consistency and appearance of those creams may be almost the same, and they would all be accepted by the public as cream. If one were to take the mean quality even of the cream obtained by the shallow setting system and adopt that as the standard, and cream prepared by the centrifugal system were made containing the same amount of fat, the difference in appearance would be extremely great; it would not look very much better than milk and it would not be accepted as cream, I think, by the public. The public has practically a standard by which cream can be judged; that is, the thickness. If cream is adulterated by adding milk or something to thin it down the purchaser can at once detect it, because it looks thin. I think that the purchaser can judge the cream very much better than it can be judged by a standard of fat that would be sufficiently low to be applicable to all classes of cream.

8448. Then is what you wish to imply that there is no necessity for us to move in the matter of cream as the public is well able to take care of itself?—I think so.

8449. Have you finished what you wish to tell us about cream?—Yes, I think that is all.

8450. Turning to condensed milk, what have you to say?—I would first like to point out that condensed milk is milk from which a considerable quantity of water is evaporated, and to which in some classes a considerable quantity of cane sugar is added. In considering whether it is genuine or not we should take standards which are the same as, or practically equivalent to, the standards for whole milk or uncondensed milk. There is some trouble in taking the whole milk standards, because the standards for milk are percentages of the total, and in condensed milk you cannot express the constituents in percentages of the total milk which was condensed because you do not know and have to make an estimate of how much milk has been condensed to form one part. I think, from a consideration of the composition of milk, that the best standard would be the ratio between the total proteids and the total fat. As it is convenient in estimating the total proteids to make an estimation of the nitrogen which is contained in them, and deduce the total proteids by multiplying by a factor, I think the most convenient standard for condensed milk will be the ratio between the total nitrogen and the total fat. The standard that I would propose would be the total nitrogen multiplied by six. That figure is obtained from the fact that the total nitrogen of proteids multiplied by a factor which is variously taken at from 6·25 to 6·38 gives the total proteids. It is not advisable to have the standards too complicated, so I recommend that the decimals be abandoned—it will make hardly any difference in the results—and that the standard for fat in condensed milk shall be six times the percentage of total nitrogen.

8451. Are you aware of the actual process of the manufacture of condensed milk from your own observations?—Yes.

8452. I suppose it is the fact that condensed milk is made from mixed milk?—Yes; and as a rule from large quantities of mixed milk.

8453. So that in the case of condensed milk we are dealing rather more with the average condition of milk than we should be perhaps in the case of the ordinary fresh milk supply?—Yes.

8454. There would be no injustice, therefore, in the case of condensed milk to assume a somewhat higher proportion of fat than in the case of other milk?—No, I think not.

8455. You think that we might start with a higher ratio of fat in the original milk?—Yes, I think so. I think that would be perfectly fair.

8456. What ratio would you suggest that we might take without any injustice?—The ratio that I have suggested—namely, six times the total nitrogen will be about equivalent to a standard of three and a quarter.

8457. But that is surely a very low amount of fat, if we are dealing with average milk?—There is one difficulty in taking the average. The figures which I gave you for the average have been the average for the whole year, but the average in individual months is not the same. For instance, take the table which is before me. In 1898 the average percentage of fat in June was 3·56 per cent., which was the minimum, while in October and November it was 3·98 per cent., which was the maximum; so that this figure 3·83 is really an average of figures, varying from 3·56 to 3·98. Therefore, one cannot take the average for the whole year and apply it to each month of the year.

8458. If you suggest that we should take $3\frac{1}{4}$ per cent. of fat in dealing with the question of whole milk for about eight months of the year, that standard of $3\frac{1}{4}$ per cent. having been fixed on the possibility of that milk being

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morning milk, and also having been fixed on the possibility of its being, although mixed milk, the mixed milk of a comparatively small herd, it is surely to be argued at all events that it may be desirable to take more than 3¼ per cent. where we have to deal with condensed milk—that is, where we have to deal with much more nearly the average condition of milk throughout the year?—Yes; but I should like to point out that in condensed milk you cannot assume that the milk which is produced one day is sold that day or the next or within a very short period.

8459. So we may at least assume that it is mixed evening and morning milk, that in a factory which is making condensed milk it would probably be as in a creamery in Scotland, I think, the whole supply of the twenty-four hours?—Yes, I understand the point. I had not given a great deal of attention to that point previously.

8460. Now that you begin to see it, do you still adhere to your suggestion that 3¼ would in the case of condensed milk be a proper limit, or that we might not raise it?—I am not at all prepared to adhere to that figure strictly. It seemed to me a reasonable figure from the point of view I had taken; but I do not think that I need insist very strongly upon it, bearing in mind the fact that the morning milk and the evening milk can always be mixed. I should not offer any opposition to its being raised.

8461. Anyhow, you are quite clear that the adoption of 3¼ per cent. would inflict no hardship upon the purveyor of condensed milk?—I think not.

8462. Have you anything more to tell us with respect to condensed milk?—No, nothing.

8463. I suppose the greatest difficulty we have to contend with as a committee is to devise means to check the surreptitious addition of separated milk to a milk supply?—Yes, that is undoubtedly the case.

8464. That is the fraud which is the most dangerous and the most difficult to combat, is it not?—Yes.

8465. Do you think it would be an advisable thing that separated milk should in some way or another be ear-marked—that is, that we should adopt in principle a method similar to that which probably you are aware the Germans adopt for ear-marking margarine; do you think that would be a desirable thing to do if it could be done?—Yes, if it could be done I think it would be a desirable thing, but I do not think that anything should be added to separated milk which would be, for instance, injurious to health or would interfere in any way with the legitimate uses of separated milk, for instance, in making bread.

8466. No, I think that would go without saying; we should not wish to impair whatever value the article has as an article of food; of course, there is a legitimate use for separated milk, we allow; what we wish to strive against, if possible, is the illegitimate use of separated milk?—It would be extremely desirable, I think, to take some steps to distinguish separated milk from whole milk, and to distinguish it sharply.

8467. Now, from your knowledge and experience, have you any suggestions to offer to the Committee as to how that distinction could be made, practically without in any way, as you have said, affecting the thing as an article of food?—I am afraid on the spur of the moment it is not very easy to make a suggestion; but I should think that perhaps the best way would be to add a small quantity of the salt of some metal which would be easily detected by the spectroscope, and which does not occur in whole milk.

8468. Supposing we added to the milk some form of starch which would in no way impair its alimentary character—a character of starch which is never likely to be found, in fact which could not be found, upon an English farm—would that meet the point?—I think so.

8469. There are starches which are perfectly easily recognisable by the microscope, are there not?—Yes.

8470. And their detection practically gives the analyst no particular amount of labour, and requires no particular amount of skill?—That is so.

8471. These starches would not in any way affect the quality of the separated milk as food?—No; but there is one objection to that that I can see. I presume when you say add starch you would add starch in a solid form, and you would not add it in the form of soluble starch because otherwise it would not be identified; but with the starch in a solid form by passing that separated milk through a separator again one could remove the starch.

8472. That is perfectly true; you might assume that if the starch was still in the granular condition it would remove, I will not say all, but it would remove a very large proportion of it; however, that is a detail. Still, supposing the arrangements were such that the addition of the diagnostic substance were done subsequently to the separated milk leaving the custody of the farmer, what do you say?—I do not quite follow you.

8473. Do you mean to imply by your suggestion as to the use of the separator that the milk vendor would actually put his separated milk through a separator?—Yes, that is what is meant.

8474. Of course, you know much more of the ways of milk vendors than I do?—What I meant to imply was that a man who wished to adulterate his milk would not be debarred from doing so by the fact that in order to make separated milk fit for adulterating purposes he had to again put it through a separator.

8475. I think you gave evidence before the Preservatives Committee, did you not?—Yes.

8476. I think the tendency of your evidence on that occasion was to deprecate the use of preservatives?—Yes.

8477. One at least of those preservatives, boracic acid, is, I suppose, a very easily detectable substance, is it not?—Yes.

8478. Very easily detectable?—Yes.

8479. Supposing, therefore, we required separated milk to be mixed with boracic acid, and we precluded whole milk being mixed with boracic acid, that would afford a means of ear-marking separated milk, would it not?—Yes.

8480. I think we should be pleasing everybody then, should we not—the doctors, who say that separated milk should not be given to children, and that boracic acid is hurtful to children, would be pleased?—Yes.

8481. And the milk sellers, who say that boracic acid is perfectly harmless, could at least put it into their separated milk, could they not?—Yes.

8482. (*Chairman.*) I suppose the milk vendor could by no trick get rid of this boracic acid if it was once put into the separated milk?—No.

8483. He could not separate it like he could the starch?—No, he could not separate it in any way.

8484. (*Major Craigie.*) I want to make it quite clear to the Committee that in giving the very interesting evidence you have done, and in those tables with the calculations derived from mathematical formulæ, you are speaking upon the basis of the milk received by your dairy company—the Aylesbury Dairy Company?—Yes, entirely.

8485. Can you give the Committee a distinct idea of the portions of the country represented by that supply geographically?—It is chiefly supplied from the counties of Berkshire and Wiltshire.

8486. You have not got any supplies from the Eastern Counties of England, then?—No, we have none from the Eastern Counties.

8487. Nor from Kent or Sussex?—We have only one small supply from Susex; I can practically say we have none from Kent or Sussex.

8488. The bulk of your supply comes from the South west—from Berkshire and Wiltshire?—Yes.

8489. You do not go to any extent to the north, do you?—From Cheshire we have some milk.

8490. Then you do go as far as Cheshire?—Yes.

8491. Have you noticed any leading differences that you could distinguish geographically between the milk, say, from Cheshire and the milk from Wiltshire?—I do not think so. We have noticed sometimes that some of the farms in Cheshire have supplied milk which is not quite of such good quality as the average of Wiltshire milk; but then, on the other hand, we have some milk which is rather above the average quality. Again, when we examine the milk from Wiltshire there is the same variation of quality on different farms. Therefore I do not think I am justified in saying that there is any difference.

8492. In fact your observations as to the varying quality from different sources would depend rather upon the nature of the land than upon the mere actual latitude or degree north?—Yes; but I have not any exact information.

8493. The question of climate or rainfall has not been considered by you in reference to this?—No; there are not any striking differences which would lead me to suppose that there is any influence of that sort at work.

8494. You attribute those striking differences mainly the differences in the quality of the land, do you?—I was saying that I had not observed very striking differences.

8495. When you make the recommendation that the standard you propose to this Committee should be a varying standard for different seasons of the year, and that the two months in which the standard should be low should be May and June, you are speaking with a reference mainly to the two counties you have just mentioned?—Yes.

8496. But you do not propose that the same two months would be equally applicable, say, to the North of Scotland—Aberdeenshire for instance?—I have not any experience of the North of Scotland, so I cannot give any evidence on that.

8497. Have you considered the fact that if a varying standard were agreed to, there might be an argument for it varying in different months in different parts of the country?—That point has not come before me at all.

8498. But you recognise that a varying standard might give rise to that point?—Yes.

8499. The conditions you find in your milk in May and June might perhaps in some other parts of the country occur at a different period of the year?—Yes, I can quite understand they might.

8500. I notice in your tables, particularly in Table 4 that there seemed to be a distinct decrease, perhaps I ought not to call it a decrease, but a more marked minimum in the last two years—1898 and 1899—than in any other of the years in those very months of May and June?—Yes, that is so.

8501. In no other year out of the six have you ever had as low monthly minima as those of 1898 and 1899?—That is so.

8502. Have you attributed those to any particular weather conditions, drought or otherwise, present in those years?—As a matter of fact, in both the years, 1898 and 1899, we have had a drought, and the two facts lying side by side, namely the poorness of the milk on the one hand, and the drought on the other, suggest that there may be some connection between them.

8503. Would you say that the period at which the minima were experienced, namely, May and June, was in both years the period in which the drought was most marked?—I am speaking from recollection, and I think not; I think in 1898 the drought was most marked in August and September, but I am open to correction on that point. I think in 1899 the drought took place earlier, and that it was all over before August.

8504. Your presumption agrees with my own impression of the periods, but you do not, therefore, explain on that basis why the two years 1898 and 1899 should both be weakest in the months of May and June; the drought would hardly explain it?—That would hardly explain it.

8505. (*Chairman.*) All our evidence has been so far to show that drought does not affect the fat; it is the solids not fat that fall so appreciably low when a drought is on?—I think that on the whole my experience is that the solids not fat are affected far more than the fat.

8506. (*Major Craigie.*) I wish to know whether you are of opinion that the percentage of fat is really affected by the drought?—I should not like to say that it is affected; but I wish to point out that these two years were years of drought, and that they were years of low fat, and although those two facts occurring in the same year may be a coincidence, it may also be held to indicate that there is some connection between the two. But I certainly would not like to say, on the present evidence, that there is any marked connection between the two.

8507. But you do recognise in those two years that your results have been poorer than they were in the four previous years?—Yes, we have that fact.

8508. In answer to Professor Thorpe, you suggested a desire to have an official method of analysis laid down; would you suggest that there should be absolutely one method, or that it should be a choice of methods?—I should think that would depend on the results obtained in the laboratory. If we could find two or three, or even more, methods which worked under certain stated conditions, would in different hands, give the same results, I should see no objection to having two or three alternative official methods; if, on the other hand we could only find that there was one method which would give the same results, I should think that the official method should be restricted to that one.

8509. You have referred in your *précis* to the use of the Gerber test, and I should like to know whether you have any experience of the working of the Babcock test as a rough test of milk fat?—I have had a small experience with the Babcock test.

8510. Have you had any complaints as to the method of the markings on the bottles used in that test; I think you have had a large experience in those matters?—I am afraid that my experience with the Babcock is hardly sufficient to enable me to answer that, but I may say that I have not had any trouble with the markings of the bottles, either with the Leffmann-Beam test or with the Gerber test.

8511. I was going to ask that; with the Gerber test you have not had a complaint of unequal marking or inexact markings?—No, and I have examined large numbers of bottles. I usually get my bottles now from one source that I can depend upon. They are all well-marked.

8512. We have had it in evidence before us that some difficulties have been experienced; but that is not your experience?—It is not my experience.

8513. (*Dr. Voelcker.*) You have given the Committee your reasons for adopting a churn as the unit; this has been based upon churns, you say, the contents of which are sent out by a dairy company; have you any views on the preference of taking such a standard, or taking as a standard the quality of milk sent out from farms, or the quality of milk as it passes through the hands of a public analyst?—I should like to say that my Table 3 is based on the milk which is received from farms, and my Table 4 is based on the milk which is sent out by the company; so I should certainly have no objection to having the standard based on the quality of the milk which is sent out from the farms. I do not think that the experience of public analysts would prove quite so reliable, for the reason that the number of samples of morning's milk and the number of samples of evening's milk is unknown to them, and it depends on the practice of the inspectors in taking the samples which they get. I might point out that in the largest district in which we serve—the county of Middlesex—in the last four years 29 samples have been taken under the Sale of Food and Drugs Act, by the county inspectors from our company; of those 29 three were morning's milk and 26 of them were evening's milk, therefore, if I may take the experience of the Aylesbury Dairy Company as representative of the whole—and I think it is quite fair to assume that—the public analyst for Middlesex receives samples which represent evening's milk more than morning's milk. I simply take that as a typical case, as it is a very large district.

8514. (*Mr. Farmer.*) By morning's milk, do you mean the morning delivery?—I mean by the morning's milk the milk which is milked in the morning.

8515. They have taken the largest number of samples of the milk which is milked in the morning, do you mean?—They have taken three samples of the milk which is milked in the morning, and 26 of the milk which is milked in the afternoon.

8516. (*Dr. Voelcker.*) That is in the county of Middlesex—Yes.

8517. But that may vary in different counties in different parts of the country?—Yes, and I have no doubt that it would do so. I simply mention that to show that it would be hardly right to give as much weight to the experience of public analysts, as, for instance, to the experience of analysts who examine milk supplied direct from farms, because the latter know the incidence of evening and morning milk.

8518. (*Mr. Barham.*) Were those 29 cases in four years, did you say?—Yes.

8519. (*Dr. Voelcker.*) May I infer from what you say that the quality of milk, as represented by the samples that pass through public analysts' hands, is likely to be higher than that sent out by a dairy company?—It may be higher and it may be lower. I think in the case where the incidence of samples lies chiefly on the

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evening milk, it is likely to be higher; and in the case where the incidence lies chiefly on the morning milk, it is likely to be distinctly lower.

8520. Do you consider there is anything regulating that in any way?—No, it depends on the method adopted by the inspector in taking the samples.

8521. A large number of the samples that a public analyst may have, may prove to be adulterated?—Yes.

8522. That would tend to throw the average lower?—Yes; I was excluding those ones which are certainly adulterated.

8523. Your views as to the working of the standard adopted by the Society of Public Analysts have been based very much upon a consideration of what the quality of the morning milk sent out by a dairy company may be?—Yes; but I would also say not only sent out, but received and sent out.

8524. Considering it from the point of view of the public as consumers, would you say that the quality of the milk that they receive as a whole was considerably above that?—Yes.

8525. Turning now to your Table 4, in which you give the maximum and minimum results, could you give us some idea as to how many of the samples approach to the maximum and how many to the minimum; you have told us that, generally speaking, the maxima are morning and the minima are evening, but what about the general quality?—If I understand you rightly, taking the 1st January, 1894, you want to know how many samples there would be with 4·4, how many with 3·4, and how many lying between?

8526. I take May, 1894; the minimum during that month is 3·10 of fat—that might be a single sample, might it not?—Yes; these figures are all single samples probably.

8527. They represent the contents of churns?—Yes; there may have been two or three, but the number showing the minimum will, as a rule, be only one; in the same way the number showing the maximum will be only one or two. The bulk of the samples will be at some intermediate figure.

8528. Taking the 1st of May, when you have got one churn showing 4 per cent. of fat and another 3·3, about how many churns were examined altogether, would you say?—That would represent something like 200 different bulks of milk; I do not say that the whole 200 were examined, because some of the 200 were filled out of the same bulk, and the bulk was examined.

8529. How many of that 200 approach nearer the higher point, and how many to the lower; could you give us some idea on what proportion of high samples to low samples these figures are based?—I should say that probably there would be about one-twentieth of the samples which were at the minimum and one-twentiteh at the maximum.

8530. So that the great majority of them come nearer to the maximum than to the minimum?—No, the great majority will lie at an intermediate point. The samples showing the minimum will be comparatively small in number; the proportion will not exceed, as a rule, one-twentieth of the total number.

8531. Then your figure of 3·8 of fat is the mean of all the samples in all the years that you have had to do with?—Yes.

8532. When you have made up Table 3, and speak there of the deviation from the mean, what is the mean that you have taken?—The mean I have taken is the arithmetic mean of the whole of the samples examined.

8533. What would that be in fat; do you mean by the mean 3·8 of fat?—It would be the mean for the month. For instance, in January, 1894, the mean was 3·98, and in June, 1898, which is a low one, the mean would be 3·56. I have used the mean for the month.

8534. The mean in the case of Table 3 has been a mean of all the samples that you have examined, and not having reference only to morning's milk?—It is the mean of the whole of the samples.

8535. So there is a considerable difference between your mean and your standard?—Yes.

8536. Then in the formula that you put out, what is the mean there?—The mean is the same thing.

8537. It is a variable mean?—It is variable; it is the mean for the month.

8538. How would an analyst practically use a formula like this?—Do you mean in calculating out his results?

8539. Yes; I am a very bad mathematician, or rather I am no mathematician at all?—The way that I have done that is that I have subtracted the mean from each individual result, or each individual result from the mean, according as it is higher or lower than the mean; then I have squared that figure which I obtain by subtracting; I have added all the squares together; I have divided by n—1, n being the total number of samples; I have taken the square root of that, and then I have multiplied that figure by the factor.

8540. This is a formula to give you the deviation?—Yes.

8541. Would it be of any practical use to an analyst, or is it merely what has been used by you in getting out these tables?—It is simply and solely to calculate these tables out. If an analyst had to calculate other tables of a like nature he could use that formula; but it would not assist him in his ordinary analytical work at all.

8542. So it is of no particular use to this Committee?—No, it is simply and solely to enable me to get these tables out.

8543. (*Major Craigie.*) You have prepared these tables by this formula, in order that you may succinctly lay before us what has been the variation from the mean?—Yes.

8544. Which cannot be done by any other than a mathematical formula?—No.

8545. And that is a commonly accepted method of showing the deviation?—Yes.

8546. (*Professor Thorpe.*) Do you think your numbers are sufficiently extensive to enable a deduction to be made on purely actuarial methods as to the probability that any one sample of milk will be below a certain proportion?—I will give you the actual numbers of the samples, and then you will see the total number of samples examined by that formula in the six years is 76,058.

8547. Are the data in such a form that we could calculate by the common accepted methods based on the theory of chances what the probability is that any one sample will depart from a limit which we might fix?—Yes.

8548. The data are sufficient, and of a sufficient character?—Yes; I could hand in a table showing those data that will give it in regard to the fat.

8549. That is exactly the kind of table that should be made; do you hand in that table?—Yes (*see Appendix No. XXV*).

8550. (*Dr. Voelcker.*) Is there any difference between the mean that you make use of in this formula and the statement above as to the average amount of the constituents of milk; are those two terms synonymous?—Yes.

8551. The value of this formula depends very much upon what the mean may happen to be?—Yes.

8552. Then when you tell us that the average amount of these constituents is of comparatively minor importance, surely that detracts very much from the importance of the formula?—I think not, because to say it is of comparatively minor importance implies that if taken alone it is of comparatively minor importance. In the formula the mean is only one factor in the calculation, and it cannot in the formula be considered apart from the others. In conjunction with the others—the variations—I consider it has great value; alone it is of minor importance.

8553. Then you have told us that 3·8 of fat represents generally the composition of samples of morning and evening milk over several years?—Yes.

8554. Do your figures differ materially from the long series obtained by Dr. Vieth?—They are a little bit lower in fat.

8555. Can you account for that in any way?—It is noticed in Dr. Vieth's series—and if my figures are taken as a continuation of his series the same thing can be seen—that there seems to be a very small gradual fall in the percentage of fat from year to year; it is very small; it is hardly noticeable, and its determination is within the limits of experimental error; but when one takes the figures for 20 years the fall is perceptible.

8556. There is a general tendency to lowering?—Yes.

8557. Have you any suggestion to make as to any practical reason for this?—I have an idea—I cannot put it forward as a statement, which I can absolutely support—that it is due to the fact that farmers prefer cows which give a large quantity of milk, and get rid of the cows which give

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a small quantity. Speaking broadly, quality and quantity vary inversely; that is to say, the cow which gives a large quantity of milk gives a small percentage of fat. I think there is some evidence to show that the dairy cows of the country are giving a larger quantity of milk than they were, and consequently milk of a poorer quality.

8558. Do you think more attention is given now to the question of milk production in regard to quantity than quality?—Yes, I am sure it is.

8559. But you have nothing you could tell us yourself with regard to the quality of milking cows—whether that is improving or not?—No, I cannot give you any information on that.

8560. Or as to whether farmers pay any attention to the breeding of their cows with regard to the production of a good quality of milk?—I have no information on that point to lay before the Committee.

8561. You have nothing to tell us from your own statistics as to how food affects the quality?—Only broadly; I should say that, broadly speaking, food has comparatively little influence on the quality; it is only a deficiency of food that has a tendency to lower it.

8562. You have told us that you regard the limits of the Society of Public Analysts as being satisfactory; speaking of so many years back when there was a general impression that a lower standard than 3 per cent. was adopted, certainly with regard to the cases where prosecutions were introduced, you were then of opinion that 3 per cent. of fat was not at all high?—That is so.

8563. But now that there is a general belief that the standards are being raised, I understand you rather to advocate for May and June at least we should go down to 2·8?—Yes.

8564. Is there any reason for that change of opinion?—I should like to refer you to the answer which I gave to you in reply to a question when you asked me how my series compared with Dr. Vieth's. I said that a small diminution in fat from year to year had been observed; and taking Dr. Vieth's series and mine in conjunction that that diminution extended throughout the whole of the series. There is a tendency, I think, on the whole for the quality of milk to fall, and there has been that tendency for the last 20 years; and therefore the position at the present time is not quite the same as the position five or ten years ago.

856 that is quite apart from any consideration of adulteration taking place?—Yes; I have not referred to adulteration.

8566. It is not a fall due to adulteration being more prevalent?—No; I have not any evidence of that.

8567. Bearing in mind that now we have to consider the point at which the presumption should be raised, does that not rather alter your views as to the adoption of a standard as low as 3 per cent. with one as low as 2·8 in May and June?—As I understand it, the wording of the Act means that the onus of proving the case is transferred from the prosecution to the defence, that means without altering the figure in the least, that the standard has to all intents and purposes been raised, so that I do not see that it is necessary to raise the figure for the standard seeing that the Act has by that section been strengthened.

8568. But you would allow that if you had a standard of 2·8 it would leave the door open to a great deal of adulteration?—It would undoubtedly, but I hardly think that the raising of a standard from 2·8 to 3·0 would have a very great effect in checking the adulteration.

8569. Would the raising of it to $3\frac{1}{4}$?—That would have a still greater effect of checking adulteration; but then, on the other hand, if it were raised to such a height that it was very hard indeed for the milk vendors to comply with it, and there were cases brought before the magistrate in which it could be shown that, although a presumption was raised that the milk was not genuine it was really not adulterated, I think that would weaken the effect of raising the standard in the eyes of the magistrate.

8570. Your standard as to that $3\frac{1}{4}$ being too high is based solely upon certain samples of milk taken in the months of May and June which are morning milks and come from certain farmers?—Yes. I understood in asking that question that you were referring to May and June.

8571. I am. When certain farmers were sending milk below 3·25, what was the quality of the milk which was sent by the others, speaking generally?—Speaking generally one could arrange the farmers in graduation—some a little above the mean, others a little below the mean, and the greater number lying just about the mean.

8572. But you have told us that when the milk was below your required quality it was distinctly traceable to bad management by the farmers or to the ill-feeding of the cow?—I said in some cases, but by no means in all—not in the majority of cases.

8573. At the time when certain owners were at fault there were a number of others sending milk very much better than was required?—Yes.

8574. Is it in your opinion a hardship that the others should be called upon to arrange that their milk is of the required quality?—I hardly know sufficient of that; I should say that the only way by which the farmer whose milk is poor in quality could raise it would be by the introduction of cows into his herd which give a richer quality of milk.

8575. You have told us that some of these gave as an excuse that the supply of cake had gone short?—Yes.

8576. If the supply of cake has gone short it ought to be supplemented?—Yes, I think if the falling off in the quality of the milk is due to the supply of cake falling short it should be supplemented; and it is supplemented.

8577. What is the result of the remonstrances of your company based on a low quality of milk?—In some cases improvement is noticed; in other cases it remains practically the same.

8578. Take a complaint that you believe to be genuine which occurs in the beginning of May, are we to understand that that would go on in a certain form regularly all through May and June without improvement?—There would be variations in the samples; but if at the beginning of May the milk were low it would remain low throughout the whole of the two months—I do not say in every case that it would fall below our standard.

8579. That would be in the case of the morning milk?—Yes.

8580. It is morning milk only that you are referring to now?—Only.

8581. Have you reason to think that the farmers adulterate their milk, even milk that is sent to you and checked by analysis?—I have no reason at all to think that any of the farmers that send milk to us do adulterate it.

8582. It is quite possible that a number of these farmers were sending milk which is about the border line?—And that they have adulterated, do you mean?

8583. Is it not possible that they have?—It is possible but it is excessively unlikely.

8584. Because of the system of checking it by analysis that you adopt?—Yes, I think so.

8585. Does the company, if I may ask it, give a higher price for milk which is over $3\frac{1}{4}$?—The contract is made out which specifies the price to be given, and the price is independent of the quality. Of course, if a farmer has reason to believe that his cows give a higher quality than usual, it is quite open to him to make a bargain, when making his contract, and I believe that in some cases he does make a bargain with our company.

8586. So that your basis of $3\frac{1}{4}$ per cent. of fat and the amount that you pay for it are based on the consideration that in May and June it may possibly be a little bit below that, but that that is made up for in other times of the year?—Yes.

8587. But at times of the year when there is no fear at all of the milk being as low as 3·25, does not that lay the door open to a good deal of adulteration on the farm, especially in the case of morning milk, and have you any check upon that?—We have the check that first of all there practically is not time for adulteration, because the milk has to come up twice a day. That is a very small check. Then we have the analyses, and we compare one farmer with another, and if one man were to drop very suddenly, or be a great deal below the others, our suspicions would be aroused, and we should take further steps to ascertain.

8588. If a man were systematically to send on afternoon milk containing 3·25 or 3·35 of butter fat, would you be satisfied with that?—If it were at the time of the year when all the other farmers were a good deal higher I should say certainly not.

8589. Then it follows from that that fixing the standard lower than 3·25 would lay the door open to a great deal

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of adulteration?—It would. The difficulty that one has to contend with is that one has to steer between punishing adulteration on the one side, and sending possibly an innocent man to prison on the other. As I represent a company some of the members of which may possibly have to go to prison if a very high standard is adopted, I do not feel justified in advocating a very high standard.

8590. But the fixing of a standard of 3·25 would practically only affect, in your opinion, certain samples in May and June of morning milk only?—It might also affect the evening milk; although the evening milk is on the average higher than the morning milk, it is not uniformly higher, and it shows also variations as well as the morning milk.

5591. But there would be no fear of that falling below $3\frac{1}{4}$, or there ought to be no fear?—It would be far less common than in the case of the morning milk.

8592. Do you know of any case of genuine milk supplied to you falling below $3\frac{1}{4}$ of an evening?—Yes, certainly.

8593. Have you any figures here to show that?—I am afraid I have not got any of those figures here.

8594. But you would allow that it is very exceptional?—It is far more exceptional than in the case of morning milk.

8595. You have mentioned that genuine samples falling below 8·5 per cent. of solids not fat can be distinguished from adulterated samples by making determinations of milk sugar, proteids, and animal and mineral matter; have you any figures that you would suggest by which a standard might be fixed, taking into consideration the proteids and the mineral matter?—I would suggest that the figure for proteids should be equivalent to 0·5 per cent. of total nitrogen, and 0·7 per cent. of ash.

8596. Would the addition of any proviso as to what the nitrogen and the ash should be, be of practical value in setting out a standard for milk?—I think it would, decidedly.

8597. Do you see any difficulty in appending to the statement of the amount of fat and solids not fat in milk, limits as to the amount of nitrogen and ash?—No, I do not see any at all.

8598. Would you suggest the Committee giving these in addition?—Yes.

8599. Would you agree that if this were introduced the analyst would be able in many cases to certify to the presence of separated milk, where a mere statement of fat, and solids not fat would not necessarily give it?—I hardly see how those figures would at all help in the detection of separated milk.

8600. I will put it generally; either the removal of fat or the addition of water, or the addition of separated milk might be checked by the consideration of the amount of nitrogen and ash in milk, in addition to taking into account the fat and the solids not fat?—Might I ask if you are referring to a paper which was published in a chemical journal a short time ago?

8601. No, I am speaking generally?—Speaking practically, the proteids and the ash would have so little effect in the case of the addition of separated milk that they would be of no value, for practical purposes, in helping a judgment to be formed whether the milk was adulterated or not.

8602. Taking the present limits of the Society of Public Analysts, 3·0 per cent. of fat and 8·5 per cent. of solids not fat, would it not be quite possible to have an adulterated milk giving those figures, the adulteration of which would be detected by the determination of the nitrogen and ash in the way that you have indicated here?—Yes, adulteration with water might be detected.

8603. (*Chairman.*) But not with separated milk?—Not with separated milk.

8604. (*Mr. Cowan.*) I think you have suggested a variable standard?—Yes.

8605. Do you not think that that would lead to great confusion? I notice that you have a standard for May and June, then you intervene with July and August, then you have September, October, November, and December grouped together, and then you come in with the other four months. That would lead to great confusion, would it not?—I would mention the precedent that under the Metropolitan Gas Act, the gas referees have power to alter the standard for sulphur in gas; and they do that, and the standard varies according to the season of the year. I do not think that that has led to any confusion at all.

8606. Do you think it would really be practicable over the whole country to have a standard shifting four times during the year?—I do not think it is impracticable. There are a large number of things that shift according to the season. For instance, the prices of dairy produce shift continually according to the season; and that does not lead to any confusion. If, however, four alterations were considered undesirable, I would rather abandon the lowering in May and June, and only have the change from $3\frac{1}{4}$ in the winter to 3 for the rest of the year.

8607. You have stated that from 1894 to 1899 there are only two months in those years, namely, May and June, which show under 3 per cent. of fat?—Yes, speaking practically.

8608. In the months when milk is so poor in quality, is it not your opinion that during those two months it could be brought up in quality by feeding, or in some other way?—There is certainly a way in which it is to be brought up in quality; you could separate a portion of the milk and add the cream—but there are some practical objections to that.

8609. I think you stated that by feeding to some extent, and also by the addition of two or three fat-producing cows, such as Jerseys, the quality could be brought up?—Yes, I think it certainly could be brought up by the introduction of Jerseys.

8610. If that were the case, you would not put too great force on the results of those two months' analyses since 1894?—I have given the facts as I have found them under the conditions which obtain; of course under other conditions, such as the compulsory introduction of Jerseys, other facts would be obtained.

8611. The Aylesbury Dairy Company require 3·25 of butter fat, do they not?—Yes.

8612. If above that, do you give the farmer any premium?—No.

8613. But if it comes below it you threaten him?—We write to him, and draw his attention to it; but it is not often that we take any further steps if he can satisfy us that he is doing his best. It is usually only in the poor months that it is necessary to write.

8614. But if you make your arrangements with the farmer for 3·25, why should you ask him to give you more when you do not give him any premium?—We make an arrangement that it must contain at least that quantity; we do not make an arrangement that the milk shall contain 3·25.

8615. That is, from the ignorant farmer you take a percentage of fat, and you do not make him aware of it, but the man who may be just something less, you let him know at once?—I should like to point out that there is also a clause in our contract that the milk supplied must be genuine as obtained from the cow.

8616. I think you have stated that there is a tendency during the last few years for milk to deteriorate in quality over the country?—Yes, as far as my experience goes.

8617. Have you any reason to suggest as the cause of it; why should it have deteriorated?—It is based on the figures that I have obtained. The reason which I have suggested—and I have only suggested it as I have no means of proving it—is that there is a general tendency for cows to give a larger average quantity.

8618. (*Mr. Barham.*) With regard to these results that you have obtained, I want to know whether they were obtained by the use of Richmond's sliding scale or Richmonds's rule or by the Hehner-Richmond formula?—The ones that I have given in Table 3 are obtained by the Hehner-Richmond formula.

8619. What about Table 4?—That contains only the results of fat which was directly estimated.

8620. (*Chairman.*) By which process?—The whole of them were estimated by the Leffmann-Beam and Gerber processes.

8621. The centrifugal processes?—Yes.

8622. (*Mr. Barham.*) I notice that the results obtained in Table 4 seem to be more favourable than those obtained in Table 3. It take it that that arises from the fact that you have already explained—namely, that this last is as you send it out, and, therefore, it is mixed milks?—Yes.

8623. And the difference is not so great in the mixed milks as it would be in the separate churns?—On the whole they are more favourable. They are, I think, in ten cases lower in Table 4 than in Table 3, and higher in the others.

8624. That is to say, 90 per cent. is higher and 10 per cent. is lower?—Yes.

8625. So the milk on this Table 4 is more favourable than that on Table 3, which shows the milk that was received from the farmers?—Yes.

8626. I understood you to suggest that the standard should vary for May and June—that it should be then 2·8?—Yes.

8627. For September, October, November, and December—those four months—it should be higher?—Yes.

8628. (*Professor Thorpe.*) I understood from you that there are only two months in the year in which the standard should not be 3 per cent., and that even then you gave no very definite opinion?—Yes, that is so.

8629. (*Chairman.*) I understood you to say that for two months the standard should be 2·8, for four months 3·2 or 3·25, and for the other six months 3·0?—Yes.

8630. (*Professor Thorpe.*) You never specifically stated three standards, did you? Perhaps you had better be asked this directly. Do you mean three standards?—Yes.

8631. Perhaps you had better indicate exactly how those three standards should work, and in what months of the year they should be applied?—From January to April I would suggest a standard of 3 per cent.; in May and June the standard should be lowered to 2·8 per cent., although I do not wish to insist absolutely on that figure; then, in July and August, it should be 3 again; and for the rest of the year, September to December, it should be 3¼ or 3·2.

8632. When you say you do not insist upon 2·8, what is it you exactly mean?—I have taken 2·8 as a convenient figure, but if it were 2·9 I should say that will do practically as well.

8633. (*Chairman.*) I understand you to mean that in those months a little discretion should be allowed to the analyst?—Yes. I do not want to put it down too low..

8634. (*Professor Thorpe.*) I think you had better say 2·8 or 2·9, and have done with it?—I think I would leave the exact figure to the discretion of the Committee.

8635. (*Mr. Barham.*) Have all these samples been analysed by yourself, including the samples in 1894?—Yes.

8636. And you say that the results you have obtained are not quite so good, but rather slightly different, to those of Dr. Vieth?—Yes.

8637. Dr. Vieth, I suppose, is a man of very considerable experience?—Yes.

8638. I see you have quoted him several times, and you speak of being indebted to him in your book for the figures you have got, and the results that he has obtained, and so on?—Yes.

8639. I suppose, in all respects, you would consider him in every way as qualified to form an opinion as to the standards as yourself?—Certainly.

8640. I suppose his experience is far greater than your own, inasmuch as it extends over a longer number of years?—Yes.

8641. I do not know whether experience goes with age, but he is an older man than yourself?—Yes.

8642. And has had experience of several countries?—Yes.

8643. You know his handwriting, I suppose?—Yes.

8644. Is that it (*handing letter to witness*)?—Yes.

8645. I should like you to read the whole of it, if the Chairman wishes, but the only thing that applies to this is the second paragraph?—"As to your question, I believe that the Society of Public Analysts' standard—that is, 3 per cent. for fat and 8·5 for solids not fat—is quite fair, and applicable to English as well as to Irish milk. I would not advise to prosecute unless the fat falls below 2·75 and the solids not fat below 8·25, but would keep such low milk under continued control."

8646. To whom is that letter addressed?—It is addressed to you.

8647. You have heard the opinion that Dr. Vieth has expressed with regard to a standard for milk. May I ask if this generally falls in with your views?—That the standards of 3 per cent. and 8·5 per cent. are—I forget the term—does he say reasonable?

8648. "That 3 per cent. for fat and 8·5 for solids not fat is quite fair"?—I have expressed it in my evidence that it is a reasonable standard.

8649. Practically, you have made the same suggestion?—Yes.

8650. But you alter it to the extent that you think it should be reduced for two months in the year and increased for four months in the year?—Yes.

8651. Do you go so far as Dr. Vieth does when he says that no prosecution should be based on any results which are not below 2·75?—I think in making that suggestion Dr. Vieth has been probably guided by the same facts which have led me to recommend a lower standard in May and June.

8652. Several of these results in February, in March, in May, and in June are below the standard of fat which you now suggest; in Table 4 some of the results in the month of February, for instance, are below 3·25?—But I have not suggested 3·25 for the month of February.

8653. I beg your pardon. You are quite right. It is for the last four months of the year that you have suggested 3·25?—Yes.

8654. With regard to the minimum itself, so far as I can judge, your firm would send out about 20 churns each day, or somewhere about the minimum standard during the whole of the months of the different years. I think you said about 10 per cent. would be of the minimum standard?—I think I said one-twentieth, which is 5 per cent.

8655. That would be 10 churns a day containing milk of the minimum standard which your firm would send out on at least 10 rounds?—Yes, I think you might say that, speaking roughly, that would be about it.

8656. If milk arrives at a specific gravity of 32, with a butter-fat contents of, say, 2·5, have you any means of distinguishing that from milk containing a butter fat of 3 per cent.?—Of the same specific gravity?

8657. Yes, or of any other specific gravity. I do not mind?—It would be at once shown by an estimation of the fat.

8658. Have you attempted to estimate the fat before you send the milk out?—We have not in the bulk of cases.

8659. So that if a milk arrived at your dairy with a specific gravity of 32 or 31, and contained only 2½ per cent. of butter fat, it would be sent out?—I should think not. It would probably be mixed with some other milk of a higher percentage.

8660. Anyhow, it would not be detected and put aside—indeed it could not be, because you have not the time available?—No, it could not be done on a large scale.

8661. The probability is that it would not be sent out by itself; as you have previously explained, it would be mixed with 7 or 8 or 10 or 20 churns of other milk?—Yes.

8662. Therefore the public generally would not get it at 2·5?—No.

8663. Although you might have received it at 2·5?—Yes.

8664. Supposing you received the milk at the standard that you suggest, that is to say at 3·25, and sent it out in that condition; must it of necessity be so reported upon by the public analyst? Would there be any reasons for variation in the quality from the time of your sending it out till you received the report of the public analyst? Must his report be exactly the same as the 3·25? For instance, would you be sure of getting the report from the analyst supposing you had sent one of your men out with a churn of milk which you knew contained 3·25 of butter fat showing in the certificate the same amount? You see what I mean. I am referring to its having been drawn out of the churn in transit, and that kind of thing?—Do you refer to the experimental difference between analysts or to the rising of cream in the churn?

8665. I refer to two or three different things really; I refer to the difference in methods, the difference in the personal equation, the difference arising from serving on the round or from the counter, and also the difference in dividing the sample when the inspector gets it?—The variations in all of those four things would affect the results.

8666. And it might affect them to the extent of how much—I think it would be a very small figure, would it not, if we take 0·1 for each?—One might allow—excluding, of course, unusual conditions—0·25 as an extreme.

8667. So that although you had sent your milk out at 3·25, it is quite on the probabilities of the case that it might very easily and frequently arise that the results

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found on analysis would show 3 per cent. of butter fat?—I would not like to say easily and frequently. My reason for saying that is because the methods which I adopt, and adopt purposely, are those which have a tendency to give differences of method and personal equation in the low direction; so that it would be more probable that the public analyst would find rather higher than I should than he would find rather lower.

8668. With regard to the change that you explain takes place on the round when milk is served in the ordinary way, of course we know that your company under your guidance do take considerable care to prevent that change taking place?—Yes.

8669. And, of course, other companies do too?—Yes.

8670. I suppose your company does not supply a thousandth part of the milk supplied in London?—I cannot say what the proportion is. It must be more than that however.

8671. Therefore all that we can treat of on this matter before this Committee is what is general and what is usual more particularly, and we cannot altogether legislate on what is quite exceptional, and may, perhaps, only be a thousandth part of the whole?—I think we might practically confine ourselves to the rising of the cream in the churns.

8672. And the division by the inspector and the personal equation—because as you have pointed out that might be 0·1 either one way or the other?—As I have already said, I am of opinion that any difference due to the personal equation will lie rather in the high direction than in the low direction.

8673. But everybody cannot be higher than every other body, can they; you cannot have everybody going up steps?—No, but you are not comparing everybody with everybody else; in taking my figures you are comparing other people with myself.

8674. True?—I consider that I have adopted methods which, if anything, will give me low results rather than high results. That is shown, I may say, in Table 6. At the end of the estimation of the fat you will see a column or line headed "Centrifugal (R)"; those are my results. If you will compare the results, either the average or the others, you will see that my tendency is to give a smaller figure than the other results.

8675. You have said that between two analysts the difference would only be 0·1, but apparently here between the Somerset House method and the Werner Schmidt method, which we have heard spoken of very highly before this Committee, there is a difference of almost 0·5 if the printing is correct?—Do you mean in the average?

8676. I am taking H. now?—H. You will observe this is rather an exceptional sample, and at the end of the table there is a note printed that it was difficult to obtain an average sample of that milk.

8677. So that when there is a large proportion of cream in the milk the results are not so satisfactory; there is a greater variation between analysts than there is when there is a smaller proportion?—Yes; it is harder to take a fair average sample of it than when there is a small proportion of fat.

8678. What do you think would be the difference in the variation in the milk sent out in an ordinary churn and delivered en route by an ordinary man?—I think that if care were taken it could be kept within 0·1 per cent. either way; if care is not taken it might be very much larger.

8679. You have a table in which you show where some interior fitting is put into a churn and where the churn is not fitted?—Yes.

8680. There seems in that case to be a difference of 0·15 where the churn is fitted and of 0·55 where the churn is not so fitted?—The milk in each case contained 3·75 of fat.

8681. So that in that case it varies more than what you said, namely, 0·1 per cent., without allowing for the personal equation and that sort of thing?—You will find in the fitted churn the biggest variation is 0·1 down and 0·05 per cent. up; in the unfitted churn it varies from 0·65 per cent. down to 0·65 per cent. up.

8682. So that even you see with great care and with a specially fitted churn the variation is more than 0·15?—That is in the unfitted churn.

8683. At the second interval you got 3·65 in the fitted churns?—Yes.

8684. At the third interval you got 3·80?—Yes.

8685. Is not that a difference of 0·15?—Yes.

8686. That is with a fitted churn and every possible care being taken?—Yes.

8687. That is 50 per cent. more than you would suggest, and you include personal equation?—No. Those two figures lie both within 0·1 per cent. If you compare them with the composition of the milk that went out, namely, 3·75, you will see that they are both of them within 0·1 per cent.

8688. Taking that as being within 0·1 per cent., you have previously told us that there should be at least 0·1 shown for the personal equation, but according to your figures in these tables you show in some cases 0·2?—I misunderstood you. I thought you were asking what would be the allowance for the variation of fat owing to the rising of the cream; and I suggested that if care were taken 0·1 per cent. would cover it.

8689. Of course, you will not evade my questions, I know, if I can only make them clear to you. What I want to show is that if milk is sent out with 3·25 of fat in it, it does not necessarily follow that it will be so returned by the public analyst?—No.

8690. I want to know how much, in your opinion, it might vary, not with regard to your own analyses or anything of that sort, but what it might vary from the time it was sent out and put into the churn till the time we get the public analyst's certificate?—I think I see the point; how long might it go down as a minimum, making allowance for difference of analysis and for carelessness.

8691. For ordinary carelessness, not gross carelessness, of course, but for the usual procedure that takes place in selling milk in the streets?—I think if one takes the figure that you suggested, 3 per cent., that would be a reasonable variation.

8692. So that if milk was sent out at 3·25 that same milk might be returned by the Public Analyst as being slightly under 3 per cent.?—It might be returned as 3 per cent. I should also like to point out that I should expect it to be higher rather than lower.

8693. But you would not expect it to be higher than what the milk as originally sent out was?—It might be returned as 3·5; it would be more likely in my case to be 3 5 than 3.

8694. In that case, of course, if one purchaser got 3·5 another purchaser must, supposing the milk only contained 3 25, get 3 per cent.?—If they have equal amounts and if the milk is divided into two portions.

8695. Now, I will go to cream. You say that you are of opinion that no standard for fat is necessary or possible?—Yes.

8696. Supposing that a standard were fixed for cream, and a bulk of cream were obtained containing, say, 50 per cent. of butter fat, or any other percentage, would it not be extremely difficult to keep that same exact percentage in that cream at all times?—You mean that the top and the bottom would vary?

8697. Exactly?—Yes, that is so.

8698. In order to overcome that variation I take it that it will be necessary to stir that cream, or to pour it out from one vessel into another before any portion of it could be sold?—Yes.

8699. Perhaps you do not know this; it is not altogether a chemical question, and it is a question more for a practical man perhaps; but would not that pouring to and fro, and that stirring, tend to thin the cream in appearance very much, and therefore to depreciate it from the customers' point of view?—I have not observed that.

8700. In reference to these samples of the minimum quality of milk (I am leaving cream altogether) you would send out about ten churns of that same quality, would you not?—Yes.

8701. That is to say, you mix, you told us, ten or twenty churns together, and a sample of the bulk is taken, and the minimum is what you have told us here?—Yes.

8702. So there may have been 10 or 20 churns of that same quality of milk sold?—Yes.

8703. Have you got a copy of the contract that you have with your farmers?—No, I have not.

8704. Is there no fine, did you say—no penalty—attaching to their sending less than the minimum amount of the butter fat stated?—There is a penalty for the infraction of any of a certain number of clauses, and the clause which specifies the amount of fat and solids not fat is one of those clauses. There is no special penalty—there is no penalty specified for the infringement of that clause, but there is a general penalty.

8705. Which is practically not enforced as regards butter fat?—Practically it is not enforced unless there is evidence of adulteration.

8706. (*Dr. Voelcker.*) You have just mentioned a clause dealing with solids not fat as well as with fat; I understood that the agreement only specified 3·25 of fat?—No; it includes 3·25 of fat as well as the solids not fat.

8707. We have not had the figure for solids not fat, I think?—The solids not fat are 8·75.

8708. (*Mr. Barham.*) Then you write occasionally to the farmer; you say you do not write on the first occasion of a deficiency of butter fat, but you do afterwards. What constitutes a first occasion? Supposing a farmer sent you milk which is deficient now, and then had its full proportion of butter fat for a fortnight or three weeks, would a deficiency occurring again in three weeks be another first occasion, or would that be considered as a second occasion?—I am not quite sure that I have any absolute rule. I take into consideration what it has been in the meantime. I might say as perhaps I have not made it quite plain that the farmer is written to each time that I report the milk, but whether I report it or not is left to my own judgment. I consider the results and report it as I think fit. I consider the whole of the chemical evidence before reporting.

8709. (*Dr. Voelcker.*) You have the control?—I have the control in that way.

8710. It goes direct from you, not from the office, does it?—No, I report to the office, and they write from the office to the farmer, but I am responsible for not writing on the first occasion.

8711. Do you advise as to whether any action should be taken or not?—If I report it is an understood thing that action is taken—that the farmer is written to, and advised of it. Of course, I do not advise as to whether any penalty should be enforced; that is entirely beyond me.

8712. (*Mr. Barham.*) You simply report, and the chief office, if I may say so, write to the farmer whatever they think well about it on the strength of your reports?—Yes.

8713. If the milk arrives poorer than three per cent. in fat or 3·25 per cent., you are not able to ascertain it unless it is palpably skimmed, and the milk, of course, is sent out in the ordinary way mixed with other milk?—Yes.

8714. You suggest 8·5 of non-fatty solids as a hard-and-fast standard, do you?—No, I should certainly not suggest it as a hard-and-fast standard; I should suggest it being taken in conjunction with 0·5 per cent. of nitrogen and 0·7 per cent. of ash.

8715. If the non-fatty solids were taken as a hard-and-fast standard what amount of non-fatty solids would you suggest that standard should be?—Taking Table 3, I think that it is seen there that to all intents and purposes except in the months of July and August, and sometimes September the figure calculated is practically 8·5; anyhow, it occasionally falls between 8·5 and 8·4, which for all practical purposes may be taken as the same. So I think that 8·5 could be adhered to except in those three months—July, August, and September; there it might be lowered to 8·3 or 8·25, which is eight and a quarter as a round figure.

8716. Then would you suggest eight and a quarter for those three months?—That is if the evidence of the nitrogen and the ash were not to be taken into account at all; but as a matter of fact I think even if it were not specified by the Committee it would be taken into account by the Public Analyst.

8717. We cannot assume anything of that kind, because if the Board of Agriculture definitely fixed standards which this Committee recommends, of course the analyst will have no discretion left to him, but would simply report upon those standards; and some of your figures show, I think, about 3 per cent. of water as possible in those three months, although, of course, the milks in Table 3 are genuine milks?—Yes.

8718. How are duplicate samples obtained by the Sanitary Inspectors dealt with; are they dealt with in your laboratory, or are they sent elsewhere for some independent opinion?—They are sent to an independent analyst.

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8719. They are sent to Mr. Hehner, I think, now?—Yes.

8720. I think some time ago they used to be sent to the individual analyst, who would have to deal with the original sample, did they not?—No, they have not ever been.

8721. Not in your time?—Nor in Dr. Vieth's time. I think I will explain exactly what we do if I may. As soon as a sample is taken under the Sale of Food and Drugs Act directly the man returns he hands in his sample to the foreman, and the foreman advises me of it. I go downstairs and take a sample from his churn, which has not been touched since his return. The churn, I may say, goes out with a seal on it, and the seal is intact. I open the churn and take out a sample of the milk which is in the churn. We also then take the sample which was taken from the man before he left the dairy. The sample which is taken before he started is divided into two parts, one part is sent to Mr. Hehner, the other I examine. The sample left by the inspector is sent to Mr. Hehner without being touched. The other sample which I have taken is divided into three parts; one portion is sent to Mr. Hehner, one portion I examine, and the other portion is sent to a third analyst, who is now Mr. Harland. In previous years it was the custom to send that to the public analyst who had examined the milk.

8722. The public analyst who would have to certify upon the sample that the inspector had obtained?—Yes.

8723. That is now altered?—Yes.

8724. I think something came out in one of the police courts with regard to it?—Certainly not. It was not in my time, but the reason, I am given to understand, why it was altered was that a vestry for whom one of the analysts acted objected to his analysing the samples.

8725. Among these tables I find no reports at all of the samples of milk taken on the rounds, or returned to the dairy?—No, I have not included those.

8726. You have not them with you I suppose?—No.

8727. Do you know of your own knowledge they have varied very much from these?—Speaking broadly there is a very small variation.

8728. Amounting to 0·3?—I am afraid I cannot give you the figures without referring.

8729. (*Dr. Voelcker.*) Have there ever been any prosecutions against your company?—No, we have had 206 samples taken under the Sale of Food and Drugs Act, but we have not had a prosecution.

8730. (*Mr. Barham.*) Only 206 samples in 25 years?—The number is 206 as far as our returns go; that does not include the whole 25 years, I think it covers about 15 years as a matter of fact.

8731. You are so very highly favoured; they know you are at the head of affairs, and that everything is managed well. What standard have you for non-fatty solids for frozen milk, or have you not taken that into consideration at all?—I have not taken that into consideration, because it is a thing which is extremely rare that milk gets frozen. It only happens on one or two days in the year in the winter, and then when milk is likely to be frozen it is, of course, common knowledge on account of the low temperature, and one can easily make an allowance for that at the time.

8732. So that you think that if we have a very cold winter, and milk is frozen on several days of the year, we need not make any special standard for that, but that it may be assumed that the presumption may be raised that the milk has been watered, and we may leave it to the farmer or dairyman to defend himself, and prove that the milk was frozen on that occasion?—I think that in an exceptional case like that it would have to be left in that way.

8733. (*Chairman.*) How does an inspector take a sample of frozen milk?—He would ask for the sample, and the man would serve him the best way he could; if it would run out of the tap of his churn, he would serve him out of the tap. Milk never freezes as a whole, but small particles of ice form in it.

8734. (*Mr. Barham.*) Who takes the samples at your branches; you cannot, of course, do so?—No.

8735. You have to depend upon somebody to take those samples, and convey them to you?—Yes

8736. I think you have pointed out that there is

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more variation likely to arise in taking samples than there is really in analysing the milk?—Yes.

8737. But you think you can depend on the people you have to take those samples accurately, so that you can actually rely upon the results that you have shown us here?—Yes, I make inspections from time to time of the men who take samples, and see them at their work and check them; and I have every reason to believe that I can rely upon them.

8738. Have you a table anywhere showing the milks that come to hand which are not sold, and which are deficient in the respective solids?—I have a table which I have handed in, giving the number of samples which fall at each one-tenth per cent. of fat; I have no others.

8739. That includes all your inferior milks or what you might term adulterated milks, if there are any?—It would include all the milks as far as the percentage of fat is concerned; I have not handed in any percentage of solids not fat.

8740. It has been suggested here that to enable us to make a higher standard or to suggest a higher standard for milk that we should otherwise fix, the two meals, the a.m. meal and the p.m. meal should be mixed together. As a practical man, do you think that would be possible in the milk business of London?—Not under the present conditions.

8741. Can you conceive any conditions under which it would be practicable?—If to each dairy there were attached a freezing plant and a large cold storage room, where half the morning milk could be kept over till the evening milk arrived, and half the evening milk kept over till the morning milk arrived, it could be done. That would, of course, necessitate a considerable amount of space, and I think it is hardly practicable.

8742. You would not recommend such a course?—I do not think I would like to recommend such a course because it would certainly enhance the price of milk.

8743. I think you said, in regard to the milk that arrived at your firm yesterday, half the samples that you tested were below your standard of 3·25?—Yes.

8744. Were many of them below 3 per cent.?—No, there was not a single one below 3 per cent.

8745. How many farmers have you?—About 50 farmers.

8746. And mostly in the counties of Berks and Wilts?—Yes.

8747. As has been pointed out before, the experience you are giving to us is the result of the milks that you received from those two counties, or very largely so, but including some milk from Cheshire perhaps, and one or two outsiders?—Yes.

8748. Berks and Wilts are both good counties for the production of milk, are they not; I mean as to the quality?—I have not any special information.

8749. You do not imagine your company would go to the worst counties for milk, do you?—Our company goes to those counties because they are on the Great Western line, and we are close to Paddington.

8750. Do you send out any so-called nursery milk?—Yes.

8751. Do you charge a higher price for it?—Yes.

8752. A penny a quart, I suppose?—Yes.

8753. You send it out perhaps in sealed bottles or cans, or on some system of that sort?—Yes.

8754. Do you send much of that out?—I am afraid I cannot give you the quantities, that is outside my province.

8755. I will not press the point, but I suppose it might be perhaps ten or twenty per cent. of the whole?—I should not like to say, but it might be something like that.

8756. Does that contain more butter fat than the ordinary milk sold at 4d. per quart?—It contains practically the same percentage of fat.

8757. What is the difference between the two milks?—The nursery milk comes from certain selected farms.

8758. Do you buy any Jersey milk—I mean the milk of Jersey cows?—Yes.

8759. Or Channel Islands cows?—I take it that the term Channel Islands cows includes Jersey and Guernsey cows.

8760. If you please; you do buy some?—Yes.

8761. And your maximums include of course the results you obtained from that milk?—That is not included in the maximum. The quantity of Jersey milk sold alone is of course small compared with the quantity of other milk, and the Jersey milk results are not included in the maximum here.

8762. Have you separate tables for those altogether—a separate book to keep them in?—They are kept separate, but they are not kept in a separate book.

8763. But you give us no return of them?—No.

8764. Then you told us that in some cases you pay a higher price per gallon where you know the milk is of good quality, or where you have reason to believe that it is of good quality?—Excuse me, I do not think I said that; I said it was open to the farmer if he thought his milk was of a higher quality to make a bargain.

8765. That is not quite the same thing then, you think?—It is not quite the same thing. I am afraid I cannot give you any definite information as to the price because that is outside my department.

8766. Then you put in a table showing the analyses of 76,000 samples; taking it roughly I find that 5,261 of them are below 3·2 per cent. of butter fat?—Yes, it will be that.

8767. But there is nothing there to denote what months it takes place in; it may take place in the two months you suggest, May and June, or I suppose it may take place in any other month?—Yes, I have not got that out.

8768. (*Mr. Farmer.*) We have had it in evidence that certain portions of Wiltshire, in the neighbourhood of Wootton Basset, for instance, produce very poor milk; is that in accordance with your view of the matter?—No, I have not noticed that any of the farmers in the neighbourhood of Wootton Basset have been distinctly below the average; I have not made any careful comparisons as to small differences.

8769. You take the churn as the unit?—Yes.

8770. Dealing with Table 7, in reply to Professor Thorpe, you said that you had got one variation similar to this in six months?—Yes.

8771. Did you mean an extreme variation like this, or did you mean to say that your churns which come out regularly from the farmers are similar?—I meant an extreme variation.

8772. As a matter of fact do the churns as they come from the farm vary one from the other every day?—Not in all cases; I may say not more than the limits of experimental error. In a considerable number of cases we find that the individual churns were within 0·1 per cent. or so of each other.

8773. Would you not get any every day or every week; would there not be some variations more than that?—There might be some more than that, but the extreme variations such as are shown in that table would be extremely uncommon—say, once in six months.

8774. Professor Thorpe suggested that we might neglect these cases where they were extreme cases of this kind; but when they are not extreme, supposing they only vary 0·5 if you get 10 churns? If you got 10 churns would they vary one from the other as much as 0·5?—Without speaking exactly I should say it is not very common indeed for them to vary more than 0·5.

8775. But they do vary that much?—Yes, they do sometimes.

8776. Then in the months of May and June do you find that even your best farmers get down as low as 3 per cent. and below that?—Yes; I think practically all at times come down below our standard to about 3 per cent.

8777. You told us that for some years past the quality of milk has gradually decreased?—Yes.

8778. Is that coincident with a decrease in price?—I think so, but I am afraid I do not know the prices sufficiently well to give you the information.

8779. You do not know that the farmer owing to the low price that he receives has to consider how he can make the milk at the price rather than how he can make good milk?—I should think that certainly he must have considered that. I think that that may explain the falling off in the quantity of fat.

8780. (*Dr. Voelcker.*) Did we not understand you to say that there was one price through the year?—No, there is a price specified in the contract, but that price

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is not the same throughout the year, or rather it is not necessarily the same.

8781. (*Mr. Murphy.*) Mr. Barham referred to the various circumstances intervening between putting the milk into the churn and the time when the sample is taken for analysis, or the time when it is examined as affecting the result of the analysts' examination?—Yes.

8782. Would some of those already have had their effect at the time you examined your milk—I take it that the milk was examined in London?—Yes; are you referring to Table 4?

8783. Yes?—Certain of these causes would have affected the results. For instance, experimental error would have affected these results, and the variations due to the taking of the samples would also have affected them.

8784. So that in any allowance made for that in fixing a standard we may assume there need not be a great deduction from your own figures?—It has partially been made here; it affects the result to some extent.

8785. Have you thought whether the fixing of a standard would be beneficial or otherwise upon the general milk supply of the community?—I have considered the subject, but it seems to me one on which it is not easy to arrive at a conclusion. It would be of advantage to fix a standard in some respects. For instance, if there were a standard fixed everyone would be bound by that standard, and when a case was being tried before a magistrate there would not be conflicting evidence as to what the standard was. I think that whether the standard is high or low, that would be a distinct gain for all parties.

8786. Whether high or low?—Whether high or low it would be a distinct gain to have a fixed standard from that point of view.

8787. From the point of view of convenience?—Yes.

8788. I was thinking of it as affecting the quality of the milk that is sold?—I think that if a standard is fixed, and it is fixed under the average there will be a certain number of people who will wish to reduce all their milk to the standard, but I cannot think that these people will bear any large proportion to the total vendors, chiefly because of the fact that between the arrival of the milk at the dairy in London, we will say, and its despatch to the customers there would not be time to make an analysis and calculate out the amount of adulteration that could be performed with safety. Therefore I hardly think the fixing of a standard would lead any large number of people to adulterate their milk to that standard. Then of course the fixing of a standard will mean that samples falling below that will be considered in the first instance as adulterated, and those above that will be considered as genuine.

8789. So that the effect may be rather to improve the quality of milk as supplied than to depreciate it; that is to say, assuming that a reasonably high standard is fixed?—I do not know that it will affect the average quality very much; it will tend on the one hand to prevent milks of very low quality being sold, and on the other hand it may cause some milks of a very high quality to be let down to the standard; but I do not think it will affect the average quality to a very great extent. Of course I cannot give any very definite opinion on this point, but that is my idea.

8790. You have no knowledge as to what has occurred elsewhere where a standard has been fixed, in other countries, I mean?—No, I have not.

8791. (*Professor Thorpe.*) The limits which you yourself make in your contracts are in effect as you have explained them to us an aggregate total solids of 12 per cent.?—Yes.

8792. Of which not less than 3 per cent. is fat?—Not less than 3·25 per cent. is fat.

8793. But you told us in effect that you condone 3 per cent. at all events during some period of the year?—Yes.

8794. You allowed your farmers to supply you at 3 per cent. at some period of the year; you made representations to them it is true, and no doubt some of them did their best to meet you, but others did not and could not, you said; and therefore in those cases you practically condoned the omission to supply 3·25 per cent.?—Yes.

8795. Have you considered the value of adopting the limits as being 12 per cent., of which a certain proportion, say 3 per cent., at least, shall be fat? Does that seem to you a practicable way of defining the limits?—I think I prefer to have the limit of fat on the one hand for the detection of the addition of separated milk, and the limit of the solids not fat combined with nitrogen and ash for detecting water. I think I prefer to have the two things distinct, in order, that is to say, to detect the addition of separated milk by a fat standard and the water by the other constituents. But I do not see any great objection to a total solids and fat standard, and I have no objection to urge against it.

8796. Would not one advantage of such a standard be that it would allow a certain degree of compensation, that where you have relatively, say, a low fat, say 3 per cent., you would have, *per contra*, a rather high per cent. of non-fatty solids; and although those things are not perhaps from an alimentary point of view of equal importance, still it is in the direction of compensation?—Yes; but still, on the other hand, if you had a high fat you would have a low solids not fat, and that sample might be most certainly watered. For instance, we will take a milk containing 12 per cent. of total solids and 5 per cent. of fat; that would give 7 per cent. of solids not fat. I think everyone would agree that that milk was most certainly watered, and that the reason it had a high fat was the fact that the cream was not evenly distributed throughout the bulk, or possibly even cream may have been added. Under the suggested standard of 12 per cent. of total solids with not less than 3 per cent. of fat, that sample would pass as genuine milk.

8797. What I want really to get from you as the result of your consideration of this question—because no doubt you have considered the advisability of adopting that mode as defining the limits, or have you not considered it?—Yes, I have considered it.

8798. As the result of that consideration, are you inclined to believe that a better system of defining the limits would be to define the amount of solids not fat as well as of the fat?—Yes, I think so.

8799. (*Chairman.*) How long has the Aylesbury Dairy Company been in existence?—It was started in 1865—35 years ago.

8800. Have you increased the number of farmers supplying the company much?—Yes, we have since the start, I am sure.

8801. But you have not gone much outside those two counties?—No, we have not to a very great extent. The bulk of our milk comes from those two counties.

8802. Have you no difficulty in getting the milk you want?—No, I do not think we have any trouble in getting milk.

8803. Have you had to discard many farmers who have not come up to your standard?—We hardly ever discard a farmer because he does not come up to the standard. The chief reasons we have for discarding a farmer are that his water supply is not good, or that there is some question about the sanitation of the farm, or some other reason like that.

8804. Then I suppose I may say that the cows that supply you are a pretty average sample of the cow of the country?—I have no reason to think otherwise.

8805. You said a year ago you thought that a limit of 3 per cent. of fat is certainly reasonable for the mixed milk of a whole herd, and that such milk rarely falls below this limit. That you said last year, and now you say there are two months in the year which, in your opinion, make you think that limit is too high?—Yes, a little too high.

8806. And you put in figures to show the reasons which have guided you in coming to that decision?—Yes.

8807. In 1894 your minimum in May and June was never below 3?—That is so.

8808. In 1895 in May and June your minimum was never below 3?—That is so.

8809. In 1896 your minimum is not below 3?—That is so.

8810. In 1897 your minimum was in June—the month you mentioned—only once below 3?—Yes.

8811. And the next year, once in May you were 2·95, and once in June you were 2·95?—Yes.

8812. And in 1899 once in May you were 2·90, and in June once again you were 2·90?—Yes.

8813. Those figures to me are most remarkable, and I do not see that they are strong enough for you to base your opinion that those months should have such a low

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minimum as you suggest—namely, 2·8?—In suggesting that I have also taken into consideration the figures obtained in Table 3.

8814. You have worked those figures in Table 3 in a way which I have rather a difficulty in following. Those are the probable variations or deviations, I take it, from a mean?—Yes.

8315. But they do not seem to be worked up to in your Table 4, where you take the actuals?—In Table 4 I have given the actual minimum; in Table 3 I have given a calculated minimum.

8816. It is a calculated minimum, and the probable deviation from the mean of the year?—Yes.

8317. In point of fact, if your standard had been fixed at 3 per cent. during the whole year the Aylesbury Dairy Company would never have suffered except on those five mornings during all these years?—Yes.

8818. These Tables 4 A-F show the milk the Aylesbury Dairy Company send out, and on those tables they would never get hit except on those five mornings?—That is so.

8819. (*Major Craigie.*) Are you talking here of the minimum monthly average?—No, of the absolute minimum.

8820. (*Chairman.*) The absolute minimum on certain days?—Yes.

8821. And only on five days actually in the months of May and June in those six years did it fall very slightly below the 3 per cent.; therefore the Aylesbury Dairy Company make themselves perfectly safe by the manner in which they conduct their business; and, while you may have individual farmers sending in milk below that standard, you, as the Aylesbury Dairy Company, only stood to be shot at on five times during all these six years?—Yes.

8822. As regards yourself you are pretty well safe. You can make quite sure of reaching that standard?—Yes.

8823. The question is whether those who supply you may not send you an inferior quality milk in those times, and you say the probability is that they will send you milk on those occasions according to Table 3?—Yes.

8824. And those are the people who may get shot at. Those have the chance of being shot at, at all events, during those months?—Yes.

8825. And for those reasons you suggest a lower standard to make them safe?—Yes.

8826. As a rule, apparently, you have no difficulty whatever in getting the standard you want?—No.

8827. You keep up your standard, any way, in the milk you send out? You mix large churns, and one way or other you conduct your business in such a manner that you are not likely to be shot at?—No, we take all precautions that we can against being shot at.

8828. (*Professor Thorpe.*) As a matter of fact, you are working under a 3 per cent. standard now. You know that is practically the standard on which you are judged?—Yes.

8829. You do not complain of that, do you? It does not hurt you?—No. We have been able, as far as these tables show to practically work to a 3 per cent. standard, but there are occasions on which the milk has fallen just below that.

8830. (*Chairman.*) You are perfectly safe; but those who might be hit under a 3 per cent. standard, if that were a regulation standard, would be certain individual farmers supplying you?—Yes, and also those people who do not take precautions to keep the amount of fat in the milk as far as possible distributed.

8831. You do not seem to suffer from that because you mix your milk before you send it out in such a way as to be safe, and apparently those who carry on your trade outside your house of business do the same, because your prosecutions are nil?—We have had no prosecutions.

8832. You are quite safe. Again, I say it is the individual farmer who may send you a poorer class of milk who may be run in under these circumstances. I want to make out about those farmers; you say you never fine them, but all that you do is to protest to them?—I say if we found that the farmer was doing his best, and is not adulterating his milk, he would not be fined; if we found that he was adulterating his milk he would most certainly be fined, and fined heavily.

8833. Has that occurred often, or ever with you?—It has not occurred in my time; I believe before my time there was a case in which a farmer was found to be adulterating his milk and was fined.

8834. Do you keep your farmers under close inspection?—The chief inspection that they have is by the medical and veterinary officers. We have no inspectors going about to see what the farmers do—no inspectors as detectives, if I may say so. Of course, there is the chemical analysis, which I may class as a form of inspection.

8835. (*Mr. Barham.*) You know there are a vast number of dairymen in London?—Yes.

8836. What I may term the ordinary dairymen—men carrying on the business of selling milk?—Yes.

8837. I think they have been estimated at from ten to twelve thousand, but that you would not know for certain?—No.

8838. The great majority of the dairymen have no chance of mixing the milk as you do, have they?—I am afraid I know hardly anything of the arrangements in other dairies.

8839. Dairymen buying the milk from only one farm would have nothing to mix with it?—If a dairyman bought it only from one farm he could only mix the milk of that one farm.

8840. So he would be as liable to be fined and punished, supposing the standard were fixed too high, as these single farmers, who supply you with poor milk which might be taken in transit?—Yes.

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Mr. W. W. FISHER, recalled; and further Examined.

(*For previous Evidence see p.* 120.)

8841. (*Professor Thorpe.*) I believe you wish to offer some additional evidence upon certain points which came out in your previous evidence on March 23rd?—I should like to rectify my evidence in respect of a conversation about the correspondence with the Government Laboratory on the proportion of fat in milks. I found that when I appeared before the Committee a reply had been received from the Government Laboratory, of which I was unaware at that time. A conversation took place at the Council of the Public Analysts in March, but when I appeared here on the 23rd March my answers were not strictly accurate because my memory was somewhat imperfect about that conversation. In April we had Professor Thorpe's letter and the enclosure which we had asked for, and which he was good enough to send. So therefore I desire to thank him for that document, and just to say that it is very desirable that our members should be informed of the contents of such a document, and we shall do our best to make it known amongst the Society. There is a matter on which I find I rather misled the Committee, namely, as to the proportion of our members which use the Adams method. I find on inquiry that seven out of ten members present at the Council meeting retain the Adams method for all important determinations.

8842. What is precisely meant by "all important determinations"?—I mean that where accuracy is required, not merely for sorting purposes, but where they wish to know the contents of the milk most accurately they use the Adams method.

8843. Do you wish to lead the Committee to believe that in all cases in which they initiate prosecutions they use the Adams method?—I cannot answer the question distinctly in that form. They say, as I understand, that in all important cases the Adams method is the method they rely upon.

8844. I do not quite understand what value we are to attach to the word "important." I should have thought that all cases upon which a prosecution depended were important cases?—I should imagine that the practice of the Society is to use the Adams method for that purpose. My earlier answer, I was afraid, would mislead the Committee into suposing that the Adams method, although it was officially adopted by the Society, had become practically obsolete; that is not so.

8845. The answer in which you deal with that is No. 3726; what answer would you substitute for that?—That the majority of the members of the Society whom I am able to consult retain the Adams method as the official method.

8846. This is very important. Do you wish to tell the Committee that the Adams process is generally adopted by public analysts when prosecutions are in question?—I did not put the question to my colleagues in that form—"when prosecutions are in question." I said, "I have made the statement that the Adams process is not now generally adopted by the Society, and I want to know whether I was right."

8847. You told us, you know—and you are President of the Society of Public Analysts—that you, at all events, did not use the Adams method?—That is so.

8848. Now I want you to tell the Committee whether it is, or is not, the case that the Adams process is generally adopted by the analytical profession?—As far as I can ascertain a majority of our members—seven out of ten—retain the Adams process as the accurate method. That would imply, to my mind, that they use it where they are going to prosecute.

8849. Do you distinctly tell this Committee that they do use that where they are going to prosecute?—I cannot make the statement as a matter of fact that they do use it when they are going to prosecute.

8850. (*Chairman.*) May I recall to you what you said in answer to myself on this point. I said to you, "We have heard so much of the different methods of arriving at a conclusion on a sample of milk. Can you tell me what is the general practice of public analysts throughout the country now; what method they adopt?—In the case of milks which are of a very good quality, I believe most persons calculate the fat without determining it at all. Some I know determine it by one of the centrifugal machines, such as the Gerber, and from that they calculate other things, taking the specific gravity and the fat. But in the case of doubtful samples, which have to come into court, or upon which prosecutions are likely to arise, I think most men depend either upon the Werner Schmidt or the Adams method"?—It is perfectly accurate up to that point. Where prosecutions are likely to arise I think most men depend upon the Werner-Schmidt or the Adams method.

8851. That brings you right again?—Yes, but then I found in answer to Professor Thorpe I was not quite accurate in saying that the Adams method has been rather disused, for on consulting my colleagues I find that seven out of ten retain it as the standard method.

8852. (*Professor Thorpe.*) I do not quite understand what you mean by the standard method. There are standards, like the standard yard and other standard measures, which are never put into actual use. What I want to get from you really is this—and I hope you will guide the Committee right in this—I quite admit that *ex officio* the Adams process is the standard method, but is it or is it not in the same position as the standard yard?—Not at all; not in the slightest.

8853. Do you wish to tell this Committee that the Adams process is used by the general body of Public Analysts?—I do.

8854. You do?—Precisely.

8855. You say that it is actually used by the general body of Public Analysts?—Precisely. I took a note of my colleagues. I asked them round the table, and made a note at the time.

8856. The President says that the Adams process is generally used by the general body of Public Analysts?—I can mention Dr. Dyer——.

8857. You are giving, I presume, the names of the seven gentlemen whom you specifically mention as using it?—Yes. Dr. Dyer, Dr. Ashby, Mr. Richmond, Dr. Rideal, Mr. Embery, and Mr. Richards; all those tell me they retain the Adams process as their accurate method.

8858. In all important cases?—In all important cases as I understand.

8859. I want to know exactly what meaning is to be attached to this word "important" cases; does it mean in all cases which are brought before a magistrate?—That I tell you I cannot state accurately, because I did not put that question to my colleagues.

8860. You are not able to give me any information on that point?—I am not able to give you that definite information. I want to correct that because I am afraid I was giving the Committee a false impression.

8861. What is the other point you wish to elucidate?—Another point was that I did not remember the case which followed Fortune v. Hanson (Q. 3756). The case which modified the decision of Fortune v. Hanson was Bridge v. Howard; that refers to the form of certificate.

8862. Is this merely the correction of the name of the case?—It is an addition to the name of a case. Bridge v. Howard was an important decision, because it established the validity of our form of certificate.

8863. Are there any other points?—Yes, there is another point. I have sent Mr. Rew several copies of the table of figures which I drew out, and I hoped they would be before the Committee.

8864. Would you kindly explain the object of this table?—There seemed to be some misunderstanding between the members of the Committee and myself as to the application of the present standards of the Society, so I have drawn up this table (*see Appendix No. XXI.*), which is intended to illustrate the action of the limits which we now adopt, and also what would be the effect of adopting a change in the limits of fat over all these possible cases. This is the composition of 171 samples of milk, which range from 11½ to 12½ per cent. of total solids. The fat in these samples varies from 2½ to 4 per cent. The figures show the possible combinations between those limits. Then a series of steps like a staircase divides the milks into two batches. All the milks below that staircase would, according to the standard of the Society of Public Analysts, be classed as watered, because the solids not fat are under 8·5 per cent., with one exception. That is one in the lower corner, where it is 8·4 and 4·0. That I suggested should be passed in my last examination. Then there is a strong red line across the page. All the milks above that red line contain proportions of fat under 3 per cent., and all those would be classified by our present standards as skimmed milks, being deficient in fat. Then the dotted line underneath shows how many samples would be also classified as skimmed if the standard were raised to 3·2 per cent. I should like to point out to the Committee that as the limit of the left-hand side is reached the sample which contains 8·5 and 3·0 is an extreme case, in which both the standards approach the limit. The Committee seemed to think—at least some members of the Committee appeared to do so—that I was a little inconsistent in saying that although that would be classed as genuine it was possibly not genuine. I said that was one of the difficulties that arose with the system of limits at all. There are certain milks here, however, which are just under 12, which would be generally accepted as genuine milks, although the total solids are slightly below 12. There is, for instance, 8·7, plus 3·2; that would be just under 12, and that would be just accepted as genuine. Then there is 8·6 and 3·3, 8·5 and 3·4. There are three samples there which the standard of 12 would rule out, but which at present would be accepted as genuine. Then there are two more to the left, 8·6 and 3·2, and 8·5 and 3·3; and one more to the left, 8·5 and 3·2. That is how those milks are all below a total solids of 12, and yet judged by the standard, even by the suggested standard, of 3·2 they would be classified as genuine. Then on the right-hand of that vertical double line you might have certain milks, such as 9·1 plus 3·0, 9·0 plus 3·1, 9 plus 3, each of them classed as genuine, yet possibly mixed with separated milks. A few milks just in that portion of the table would possibly be mixed with separated milks, and have the composition assigned to them. But if you come lower down to 8 6 and 3·4, or 8·5 and 3·5, those would be passed as genuine without any hesitation at all. I think with those figures before them the Committee will be able to see clearly when they are dealing with the two standards how they work out, and where in the middle you get a batch of milks just very near the 12 per cent. which may be classified as genuine, and as you approach the extremities of the table a little doubt creeps in as to their character. That is one point that I wish to bring out from my table. I also wish to point out another way in which this present division works out. If you have 171 samples in the table 40 would be excluded as skimmed and 55 would be excluded as watered, and the genuine samples would be 77. If you take the standard of 3·2 for fat, 21 of those 77 samples must be transferred to the skimmed list, leaving 56 as genuine milks on that table.

8865. (*Mr. Barham.*) Are you suggesting a different standard to what you suggested the other day?—Not the slightest. I am only showing the Committee from this table as far as possible how this works out. You have a

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number of milks with total solids of certain amounts, and this table classifies them into skimmed, watered, and genuine.

8866. (*Professor Thorpe.*) It is not quite clear at all events to me—I do not know whether it may be to other members of the Committee—precisely how this table has been arrived at?—That table is arrived at in this way: I put down 12 per cent. of solids, and how that 12 per cent. can be got at with the solids not fat plus the fat, taking every case that might occur under 12 per cent. between those limits.

8867. Those are purely hypothetical numbers?—They are numbers which may occur; every possible case is set out on this piece of paper within those limits.

8868. It is a purely arithmetical statement, and to that extent a hypothetical statement; it has no regard to the actual circumstances of milk?—They are not analyses.

8869. You simply arrange these limits in the manner you have described to us?—Yes. I have arranged these figures in the manner that I have described to you.

8870. It is an arithmetical possibility?—Yes. Then I want to point out to the Committee that I have calculated what the present standards allow for watering and for skimming, because that seems to me a practical matter which grows out of this point. If you start with an original milk which contains 13 per cent. of total solids made up of 4 per cent. of fat and 9 per cent. of non-fat, which is milk of good quality, then if you skim that milk so that you get a separated milk containing only 0·25 per cent. of fat, you can imagine that you can mix that separated milk with the original milk in certain proportions. If you mix 10 per cent. of skim milk with it the solids not fat then become 9·03, and the fat in the mixture is 3·62, the total solids then being 12·65. If you mix 20 per cent. of the skim milk with the original the solids not fat then become 9·06, the fat 3·25, and the total solids 12·31. If you mix 25 per cent.—that is the lowest I have put—the solids not fat are then 9·07, the fat is 3·08, and the total solids are 12·15. So that taking a milk of that composition the present standard allows of the addition of 25 per cent. of separated milk, and a standard of 3·2 would allow of the addition of 20 per cent. of separated milk.

8871. By the present standard, do you mean that of 3 per cent. and 8·5 per cent.?—Yes, I mean our standard. I thought that by calculating out that table I could show the Committee clearly that the limit of 3·2 or 3·25, which was mentioned, would, to a certain extent, check the addition of separated milk, but that it would still allow with milk of this character the addition of 20 per cent. of separated milk. May I mention one other thing? The variation in this addition of solids not fat is from 9 per cent. to 9·07, the increase in solids not fat is 0·07 per cent.; I think that disposes of the suggestion that the determination of the proteids can be relied upon as a criterion of the addition of separated milk to whole milk. That obviously could not be detected by analytical methods. That is all I wish to say in elucidation.

8872. Now, with respect to the other matters—take cream?—The number of samples of cream purchased under the Food and Drugs Act, as far as I can find out, appears to be small, and our members have only a limited experience in dealing with them. In consequence of that the society has never yet adopted formally any standards for this article of food. I may point out—this is apparently a repetition of Mr. Richmond's evidence—that the composition of machine skimmed cream can be made to vary by taking a different proportion of cream from the milk. If you run one gallon of cream from 17 of milk, that is 6 per cent., which is about practically the strongest which a separator can be got to deliver; it will then give you a good thick cream, which will contain over 50 per cent. of fat. Whereas, when the rate of adding the milk to the machine is increased, so that you take something like one from ten gallons of milk then the cream would contain about 30 per cent. of fat, and would be a fairly good thin cream. I find the practice in London is to produce a thick cream, and the quantity of fat in it appears to be something like 45 or 50 per cent. If a limit were fixed at all, although this is not a limit which the society has adopted, my own personal opinion is that a fair figure would be 30 per cent. of fat as the lowest limit for thin cream—not fixing a standard for thick cream because that seems to be unnecessary on account of the character of the cream betraying itself as a thick cream. That is the suggestion that I make.

8873. You have told us that your society has not felt itself called upon to make any such definitions of limits?—No, they have not.

8874. You have also told us that the society, as a whole, seems to have had little experience in cream prosecutions?—Yes, I believe they have had very little experience of cream prosecutions.

8875. Does that not rather imply that there is no necessity to trouble with the question of cream?—Some of our members thought it was undesirable to fix to fix a standard for cream.

8876. Apparently the public is well able to take care of itself?—It looks like it. I am told by the manager of a dairy company in Oxford that people will ask for thick cream or thin cream, according to what they want to use it for, and pay the same price for either. If they want it for coffee they will take it thinner; if they want it for whipping and cooking purposes, and so on they will take it thicker. They ask for thick or thin cream as they want it. If that is the case, it does not seem to be very necessary to fix a standard for it.

8877. Speaking as the President of the Society of Public Analysts, in view of the facts that you have told us, do you think there is any urgent necessity why we should trouble with the question of cream?—In my opinion there is no need at present to fix a standard for cream.

8878. Do you give that as an official opinion?—I give that as my opinion.

8879. As an official opinion?—As an official opinion.

8880. Speaking as president of the society?—Speaking as president of the society, and also speaking as a public analyst.

8881. (*Chairman.*) When you were on the question of cream, did your society consider the question of adulterants; did the question of the thickening of cream with gelatin come before them?—We can deal with that, I think, as it stands. If gelatin is added to the cream, and we detect it, we should report it as an adulteration.

8882. Then, I take it, that the samples of cream that came before the members of your society were really submitted to them with a view to seeing if they were adulterated, not with a view to seeing if they came up to any so-called standard?—Yes, and possibly also to see if they contained an excessive amount of preservative.

8883. Preservative, gelatin, and other added matter?—To see if they contained added matter.

8884. (*Professor Thorpe.*) Do you wish us to believe that practically all the samples of which the society has had experience are samples on which questions have been raised as to the presence of preservatives or adventitious matter, such as gelatin or other thickening materials?—No; they are samples which are purchased by the inspectors.

8885. Of course, I know that?—They are purchased without any instigation from the members of the society, as far as I know.

8886. I quite understand; are they samples purchased by the inspector for the possible presence of preservatives, or for the possible presence of thickening material?—In some cases it might be for one reason, and in some cases for the other. The inspectors generally get instructions from headquarters, somehow, to take certain articles.

8887. Are they ever purchased in view of any possible deficiency of fat?—I never heard that they were.

8888. Now about skimmed milk?—Skimmed milk, if it is prepared by machine skimming with good working may contain from 0·1 to 0·25 of fat; but with bad working the proportion of fat may be higher. It is found that hand-skimmed milk, where samples of it are purchased very commonly, contains something like one per cent. of fat, and commonly contains rather more. Although it is possible to reduce the proportion of fat by more elaborate skimming—setting it over again, and so on—the practice appears to be to leave something like 1 per cent. of fat in it. Some of the members of the society seem to think it is desirable to make a distinction if possible between hand-skimmed and machine-skimmed milk, and that if milk is sold as hand-skimmed it ought to be expected to contain one per cent. of fat. No standard whatever is suggested for machine-skimmed milk.

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8889. Now as to condensed milk?—With regard to condensed milk, it is obvious that the composition must approach to that of an average milk, because every batch of condensed milk is made by mixing together a considerable quantity of milk, which eliminates minor divergencies of composition. That being the case, if it is an average milk it must necessarily contain rather more fat than proteids. The average composition of milk shows that is the case. If you take as a standard for condensed milk that the milk must contain rather more fat than proteids, it is evident that the percentage of fat in the milk will not be under about 3·3, but might, of course, be more. The best brands of condensed milk reach this standard, whether they are sweetened or whether they are unsweetened. I have drawn up a small table, in which I have calculated the proportion of fat in the original milk before condensation, starting on the assumption that the proteids originally were about 3·33 per cent., and then working out the figures that I give in the margin. The Anglo-Swiss, which is sweetened, originally contained 4·1 per cent of fat, and the Minstrel milk, which is the lowest among the milks which are sweetened, but which was skimmed as thoroughly as it could be, apparently contained less than one per cent. of fat in the milk.

8890. What would you suggest as the datum line?—The datum line is that the fat in the condensed milk should not be less than the proteids, and the proteids should be determined by estimating the nitrogen, and multiplying by the usual factor of $6\frac{1}{4}$.

8891. (*Chairman.*) For the protection of the public what should the label containing this stuff bear on the outside; the proteids and the nitrogen, for instance, would be a thing that would be rather puzzling to the ordinary purchaser?—Do you mean how should the milk be labelled which has not been deprived of any fat at all?

8892. Yes; how in the interests of the consumer should proper condensed milk be labelled; what should the label state on its face this milk is?—"This milk is prepared from genuine whole milk, and contains a full proportion of fat," or "from which no fat has been removed."

8893. Would that be a sufficient protection to the public?—I should think so; if no fat were removed from a genuine whole milk it must necessarily fulfil the conditions I have suggested.

8894. (*Professor Thorpe.*) But nothing is said as to the degree of condensation of that milk?—No, if you look at the figures in the table you will see how they work. The common practice appears to be to condense it down by a ratio of from 3 to 4. I do not know that the degree of concentration makes much difference.

8895. A label such as you say might be practically whole milk, and nothing else put in it; but that would not imply any condensation at all?—No. I was not writing the label at full length. I was assuming that the milk was described as condensed milk. "This condensed milk," I should say, "is prepared from whole milk."

8896. (*Chairman.*) "From which none of the fat has been abstracted"?—Yes.

8897. And as regards bulk, would you say it could be used with an addition of so much water, and so on?—That could be done.

8898. (*Professor Thorpe.*) How may we protect the consumer, who may be buying condensed milk of a very small degree of condensation? He would obviously be prejudiced, would he not, as compared with the purchaser of some other brands in which condensation had been, as you say, between three or four times?—Yes.

8899. How is he to be protected against possible fraud of that character?—He could be protected by a statement on the label to the effect that "One pound of this condensed milk contains the original constituents of so many pounds of whole milk." He could be protected in that way if it is considered desirable to protect him.

8900. Obviously in the case of sweetened milks where the appearance of fictitious strength if given by the addition of a large quantity of cane or beet root sugar, you might have a very small amount of the actual constituents of milk present there?—Really in practice you do not. Unsweetened milks contain from 9 to 11 per cent. of proteids, sweetened milks contains from 8 to 10 per cent. of proteids, and this is only a very small number of analyses.

8901. Do you consider this is a sufficiently large number from which to draw a generalisation of that character?—No, but I do not want to trouble the Committee with a lot of analyses. There are plenty of them published in the pages of the "Analyst." These are only typical examples to show how it is possible to calculate the ratio of condensation, and whether it fulfils the condition of containing the full proportion of fat.

8902. May we gather from you that as regards the degree of condensation to which milk has been subjected there is no call for interference?—As far as I know there is no reason to interfere with that at all. I have a large number of analyses on my notes; this is only a very small number of those published in the "Analyst." I find that the proteids vary from 8·8, which is the lowest of the proteids in the sweetened kind, to 14·7, which is the highest of the proteids in the unsweetened kind.

8903. Does that exhaust all you have to tell us in respect to condensed milk?—I do not think I need trouble you with any further remarks except to point out that cheeses made from whole milk invariably contain more fat than proteids. Cheese made from a rich milk contains an enhanced proportion of fat in relation to the proteids, and cheese made from a partially skimmed milk, as in the case of Dutch cheese, contains a diminished proportion of fat in relation to proteids.

8904. Of course there may be anything in cheeses?—Yes, but that gives you some idea as to whether cheese is made from skimmed milk or not.

8905. Even in Dutch skimmed milk cheese the amount of fat may be extremely variable?—Yes. There is, I believe, a cheese called Bang, in Wiltshire, which is made of skim milk, and which gets very hard—it dries up, and it does not contain much fat.

8906. Then I think you have prepared for us a form of label?—Yes, I hand that in as a form of label which is used by one of the authorities for which I act. (*See Appendix No. XXII.*)

8907. (*Mr. Murphy.*) I do not know whether you have told us how the Public Analysts' Society arrived at their standard regarding milk; was it based upon special examination of milk?—Yes. The whole information about that is contained in the "Analyst" of about 14 or 15 years ago—the whole of the analyses and the resolution of the committee.

8908. Do you know whether those samples of milk were taken as sold to the vendor in London, or whether they were taken on the farms?—I cannot answer that question at all; I do not remember in the least how the milks were obtained.

Mr. E. J. BEVAN, called; and Examined.

Mr. E. J. Bevan.

8909. (*Chairman.*) You are honorary secretary of the Society of Public Analysts?—Yes.

8910. You have been Public Analyst for the County of Middlesex since 1892?—Yes.

8911. During that time you have analysed a large number of samples, have you not?—Yes.

8912. Altogether over 8,000, I think?—Nearly 9,000.

8913. During the last four years I believe you have analysed 5,546 samples—an average of 1,386 a year?—That is so.

8914. They have been samples that have been drawn from the very large area of 148,000 acres, and as I understand may be said to fairly represent the milk supply of the population of over half-a-million of people?—Yes, they represent the whole of the milk supply for the County of Middlesex.

8915. At a meeting of the Council of the Society of Public Analysts, held on the 7th March this year, a minority of the members, six votes out of the 13 then present, were in favour of advocating a higher standard of fat than that hitherto adopted by the Society?—Yes, that is so.

8916. Your president, Mr. Fisher, who has just given us evidence, you say fairly represented the views of the majority, but you have been asked to come forward here to represent what these six gentlemen wish to say in favour of raising the standard higher than Mr. Fisher advocated?—Yes.

8917. Would you kindly state your views, as you wish

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to present them to the Committee?—My opinion is, and I will give the reasons, that the standard ought to be raised from 3 to 3¼ per cent. of fat. Mr. Richmond has urged that there is a general diminution in the proportions of fat during the months of May and June. I have taken the results of the analyses of the samples that I have made which have been taken during those months for the last four years, 1896 to 1899, and the results are all tabulated in the tables, which are handed in. I have taken into account all the samples. I also give a table containing every sample, whether considered to be skimmed or otherwise. In framing table 13, which I shall hand in (*see Appendix No. XXIII.*) I have taken out of account all the samples which were obviously watered, and which therefore would have had their fat reduced proportionately to the water added. Although I have taken out those samples, which I felt justified in doing, I have left in all samples about which there might have been some doubt. When I say that I have taken out those that are obviously watered I mean those the solids not fat, of which fell seriously below 8·5. But then, of course, there must be included a great number of samples giving solids not fat, say, from 8·5 to 8·8, or 8·7; many of those would undoubtedly be watered, but the evidence was not, of course, sufficiently clear for one to speak positively. I mention this in order that the figures I shall give will have due significance given to them.

8918. You treat them as genuine samples?—I have treated them as genuine samples. I have made no corrections; I have included, in other words, all the samples which were obviously skimmed, and not only obviously skimmed but probably skimmed. These tables include all the samples taken during those years with the exception of the watered ones. There were 806 samples taken in the four years in those two months. In the tables giving the individual samples—the watered samples have a red mark attached to them.

8919. (*Mr. Barham.*) We have not got those tables, I am afraid; have you not got any duplicates with you?—No, I am afraid not. In Table 13 the samples are classified according to the percentage of fat they contain. I need not trouble you with the various years, I think, but taking the totals out of 806 samples analysed there were only 8 which were below, or practically 1 per cent., which were below 2·5; there were 26 which varied from 2·5 to 2·75; and so on, acording to the various percentages; from 2·75 to 3 per cent., for instance, there were 85, or 10·54 per cent. But of course even some of those would undoubtedly be skimmed samples, although no prosecution took place in that case. With regard to the others on anything below 2·75 prosecutions were instituted, and in nearly every case, I think, convictions were obtained, so that, strictly speaking I would have been justified in leaving those out because there was evidence that they had been skimmed and the evidence was in most cases practically admitted. As a matter of fact I have not taken them out, and they are included in the table. That table hardly gives a fair view of my case. In a supplemental table, which is before you, I believe, I have called attention to that. The column 3 to 3·25 in the original table 13 includes 85 samples which are so nearly 3·25, or are exactly 3·25, that no analyst would condemn them on a 3·25 standard, by which I mean this: I have not taken any other sample in those columns except those that varied from 3·2 to 3·25, and I think anyone would admit who knows the variations in analytical results that anything giving 3·2 is practically 3·25. In that column there are 85 samples which are from 3·2 to 3·25, so that in judging of those samples by the 3·25 standard it would be fair to deduct those 85. The result is then, this, that there are 213 samples which are notably below 3·25 or 26·4 per cent. of the total—that is to say, of all the samples taken including the adulterated ones 1 in 4 is below the 3·25 standard. Then similarly with the column 2·75 to 3, that includes 59 samples which are approximately 3 per cent. I have only taken into consideration those that are from 2·9 to 3 per cent. Excluding these there are only 60 samples which are notably below 3 per cent., or only 7·44 per cent. of the total. The average percentages of fat for all the districts of Middlesex and including all the samples are as follows—I am only now of course talking of May and June, which are the suspected bad months. In 1896 the average was 3·41 per cent., in 1897 3·36, in 1898 3·52, in 1899 3·71; and the mean for all the years is 3·54. That is the evidence on which I think the Committee will be justified in fixing at least as high a standard as 3·25 per cent.

8920. (*Professor Thorpe.*) You do know, I suppose, from your own knowledge whether the milks submitted to you are morning or evening milk?—I am glad you have mentioned that, because I should have thought there was at least an equal proportion of the two. I heard what Mr. Richmond said with regard to the samples submitted to me from his company. I think he said three twenty-ninths of them were evening and the remainder morning. I do not think that can be at all typical, because the samples come to me as a rule before 4 o'clock in the afternoon, and as my laboratory is in New Court by the Law Courts, and most of the inspectors live a considerable distance away, one's headquarters being at Brentford, it take a considerable time for him for instance, to bring a sample from his district, and I should have thought that the majority of the samples were morning milk. Certainly the majority of them are taken in the morning. Anyhow, I think it would be fair to assume that they are at least equally divided. There is no reason for suggesting that more of them are morning than evening.

8921. Then you would not agree with Mr. Richmond in thinking that in the months of May and June as far as London is concerned at all events, there is a serious drop in the quality of the milk supplied?—The drop is certainly not sufficiently low to warrant you, I venture to think, with submission, in fixing a low standard.

8922. A sample which reached you at 4 o'clock from Brentford would in all probability be the preceding evening's milk, would it not?—No, I should think not; it would be taken in the morning.

8923. It would be milk which had arrived during the night?—It might be one or the other, it is quite true. I do not think there is any reason for suggesting that they are chiefly morning milks. I think it is fair to assume they are average milks. Very often the inspectors are out at all times, sometimes first thing in the morning—at 5 o'clock sometimes.

8924. (*Chairman.*) Could you tell from the samples whether they are milks delivered warm to the customer or whether they have been refrigerated?—No, owing to the time that elapses, which is at least an hour or two.

8925. In point of fact you do not know?—I do not know at all.

8926. (*Professor Thorpe.*) I should like to ask you whether you have any general observations to make on the question of the standards; you, no doubt, are familiar with what the President has stated?—Yes.

8927. Do you agree with him?—I do not agree with him, of course, as regards the 3 per cent. of fat. That is the point on which I am here really. I think it might be at least fixed at 3·25.

8928. Would you suggest 3¼ per cent. all the year round?—Yes; I do not think there would be the slightest hardship in that to any vendor. The chances of an honest man—I mean the man selling the genuine product of a cow—being brought up are very remote; and even if he were he has got a chance of clearing himself. It seems to me that it is much more important for this Committee to safeguard the interests of consumers than to have any, if I might so call it, squeamish feelings in favour of the vendor of milk. The vendor, as a rule, knows perfectly well whether his cows are giving good milk or bad milk. If they are giving poor milk it is open to him either to get better cows and to mingle the good cows' milk with those he is supplying, or so to feed his cows that he can raise his milk up to the standard. There are facilities now, I believe, through the dairy associations and so on, whereby even a man in a moderate way can get the services of an analyst, so that he can know for himself what his milk is; he need not wait to have it brought to the court.

8929. I understand that you have analysed 8,640 samples during the last four years?—Since I was appointed in 1892.

8930. What method of analysis do you now adopt for the determination of the fat?—I first take the specific gravity and the fat by the centrifugal method. If the fat is satisfactory and the specific gravity is satisfactory, I calculate the total solids, and, of course, I then arrive at the solids not fat; if they are above 8·5 and the fat is above 3 I say no more about it.

8931. If they are discrepant, if they differ from those, what do you next do?—I then analyse the total solids in the way that has been described by Mr. Richmond and other witnesses.

8932. Do you use the Adams' process?—I do not, as a matter of fact. I have done on many occasions, and I have made a very careful investigation together with Mr.

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Richmond and Mr. Hehner of the various methods of analysis. I was one of those who did the samples that were quoted to-day.

8933. When you bring a case into court, do you always base it on the Adams' process?—No, personally, I do not.

8934. Do you prefer to take the Werner-Schmidt process?—I think it is simpler, and I know as a matter of fact that it gives results that are comparable to the Adams.

8935. Then you do not use this official method which we are led to believe the greater number of analysts do?—No, I do not.

8936. Neither the President of the Society nor the secretary of the Society uses the official method?—That is true.

8937. (*Chairman.*) You use an equivalent?—I satisfied myself at the time that the Werner-Schmidt, the one which I myself employ, really does give substantially accurate results. I use an equivalent method.

8938. (*Dr. Voelcker.*) The districts from which your samples are taken practically represent a number of townships around London, you may say?—Yes, that is so. I think Staines is the farthest town in that direction, and then it includes Hornsey and the whole of Middlesex.

8939. This milk is drawn in a very large number of cases from small farms, no doubt?—Yes. I should think so.

8940. It is not supplied by big dairy companies as a rule?—No doubt a number of the branches of the big dairy companies are visited by the inspectors; in fact, I know they are, and from time to time I do get samples of the various large companies; but I should think that it represents practically a small part of them.

8941. But included amongst the samples which come to you would be very probably a number from farmers who keep perhaps only a few cows?—Yes, undoubtedly; I know that for a fact.

8942. The figures drawn from your analyses would represent very fairly what people in a small way would receive?—Yes.

8943. And what people in a small way would supply?—Quite so.

8944. In some respects at least you would be prepared to maintain that that represented more fairly what a wide section of the public would get than a dairy company which drew their supplies simply from fifty farms in one particular district—Yes.

8945. The area over which the samples are taken is a very much wider one, I take it?—Yes, and it represents a very much larger milk supply than any one company, I should think, even the largest in London.

8946. That is what I wished to bring out. Have you at all gone into your figures for the purpose of seeing what the general mean of the analyses is over the year or over a number of years?—I have given that.

8947. I take it that these means you have read out to us merely refer to May and June?—Yes.

8948. Have you taken them at all over the whole year?—No, I have not.

8949. Have you any reason for supposing that it is above or below 3·25 of fat?—It is a long way—infinitely above. The means in these four years for the worst months are a long way, of course, above 3·25.

8950. So you would naturally conclude from the samples that have come to your notice that after making a deduction of those which are clearly adulterated the quality of the milk supplied under conditions such as we have spoken of just now, and to a very large section of the public in Middlesex, is decidedly above 3·25 of fat?—Quite so.

8951. The Society of Public Analysts was, so far as its Council was concerned, divided in opinion as to the adequacy of a higher or a lower standard than 3 per cent. of fat?—Yes, nearly equal among those present on that day.

8952. You could, perhaps, speak of the feeling of the general body of members, not the Council only?—I should say that the general feeling of the body of the members would be in favour of a higher standard than 3. The conditions are altered now. We were all perfectly satisfied that 3 was fair under the conditions of the old Act, but, so to speak, the new Act is more elastic, and on the ground that a presumption is raised one can safely raise the standard; in fact, it seems to me logical for us as Public Analysts, if we were satisfied with 3 under the old Act, it seems to me almost to follow that we must raise it under the new Act.

8953. Then you do not think that the plan which Mr. Richmond suggested of a standard of 2·8 in May and June would find acceptance with either the Council or the general body?—I am absolutely certain of that.

8954. What may I ask were the reasons which prevented the majority of the Council going for the higher standards?—I think it was a want of appreciation of section 4 of the new Act.

8955. Do you think that if the matter was fully understood by them now both the Council and members generally would feel that under the terms of this new Act there would be nothing unreasonable set out in demanding a higher standard than 3 per cent. of fat?—No, I think I might venture to say that if the legal bearing of section 4 were properly appreciated by them that voting would be different now. I think I am entitled to say that; that is my feeling.

8956. May I ask if it is your opinion that the hanging back from adopting a higher standard was very much from a wish to be on the safe side and not to do any injustice?—That is clearly so.

8957. We have been told that public analysts are desirous of getting prosecutions; is that at all your experience?—The inspectors may be from time to time desirous of getting prosecutions, but as to the public analyst, he does not care one jot—at least, that is my own feeling about it.

8958. His responsibilities end with the giving of his certificate?—Yes, and it is far less trouble to him to return a thing as genuine than as adulterated. He then saves himself the trouble of possibly going into court, and he saves himself the trouble of a difference with another analyst. So if he takes the line of least resistance he will return it as genuine.

8959. The giving of a certificate to the effect that a sample is adulterated involves very great responsibility on the public analyst?—Yes, and a very much larger amount of work than he would expend on a genuine sample.

8960. So that he will not report upon it unless he is quite sure of his position and of his facts and figures?—As morally sure as one can be on a variable substance like milk.

8961. In coming to these conclusions the majority of analysts would nowadays adopt very much the same procedure which you and other analysts have indicated, that is, in examining milks if they had a number of samples sent them they would adopt a ready and a very fairly accurate method of sorting out their samples?—Yes.

8962. If the sorting out process left it practically certain that the samples were genuine they would not proceed any further?—Yes, I think that is so. That is my practice, and I think it is almost universal.

8963. Your practice, and, as far as you know, that of public analysts generally, is that if this preliminary examination threw any doubt upon the sample, they would proceed to examine it exhaustively by the Werner-Schmidt, the Adams, or some other similar method which analysts are agreed gives good results?—Yes, that is so.

8964. Then, between the adoption of the Werner-Schmidt and the Adams you have no particular bias one way or the other except that the Werner-Schmidt is the handier one?—I think it is handier, and there are people who think that the Adams is the more convenient.

8965. There are a number of analysts who use the Adams method in just the same way as you use the Werner-Schmidt, because they think it is handier?—Yes.

8966. If a case of prosecution was concerned, a case such as the President described as an important case, as far as you can speak for them public analysts would use at the present time either the Adams method, the Werner-Schmidt method, or a similar one which analysts are generally agreed gave consistent results?—That is so.

8967. You have no reason to doubt the statement of the President that seven out of ten analysts would, before taking a case into court, use the Adams method?—I am sure that is what they intended to convey.

8968. You heard what the President said?—Yes, and I was at the meeting.

8969. Have you any views on the point as to whether

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the standard is best stated in terms of solids, including fat, or in terms of fat and solids not fat?—Personally I would prefer the double standard.

8970. Would you explain what you call the double standard?—I would have a separate standard of say 3 something for fat and 8·5 for solids not fat, as opposed to an inclusive one of 12—I presume that is what you mean?

8971. Yes?—I do not see any great objection to the inclusive one so long as it is made sufficiently high. There is one objection that it might possibly include the addition of skim milk or separated milk.

8972. Which standard?—The making it say 12 per cent. of total solids of which a certain proportion should be fat.

8973. Has the question been discussed generally by public analysts?—Not at very great length.

8974. And there is no strong feeling one way or the other?—No, we should be quite complacent with either the one or the other.

8975. You heard Mr. Richmond speak of the advisability, in his opinion, of adding a proviso as to the amount of nitrogen and ash which a milk should contain so as to guard against the adulteration of water?—I think if Mr. Richmond had had as much experience of police-court procedure as I have, he would not have wished that to be put on the certificate. I do not think it would be necessary at all.

8976. Would you as an analyst regard it yourself as a useful adjunct?—Undoubtedly, and in some cases one does that, but I do not think it ought to be specified.

8977. You would not approve of its insertion in any certificate?—Personally not.

8978. What would you have against it?—I think it would lead to discussions in the police-court, which would be objectionable.

8979. Do you mean questions between analysts?—Yes, and between the defending and prosecuting solicitors.

8980. You do not mean because it would give analysts more trouble?—No, I do not mean that; that would not amount to very much.

8981. But you would allow that you could tell abnormality in samples of milk a good deal from it?—Yes, you could; but then I do not think the analyst ought to be bound either by one standard or the other. Supposing he found that the thing were below 8·5, he would be entitled to take into consideration the nitrogen contents himself, or the ash and so on.

8982. Do you think, then, that the duties of the analyst would be complete if he merely gave in his figures and left other people to discuss their bearing?—Yes, I think so. If the form of certificate that no doubt will be issued stated that a certain amount of solids not fat be present, I think that is all he need say.

8983. Do you think it would be necessary for him to report in terms of fat and solids not fat?—Yes, I think so. He would have taken the other things into consideration before he certified that the thing was adulterated.

8984. But they would not alter his figures of fat and solids not fat?—No, but they would have altered the conclusions at which he would have arrived before issuing the certificate. That is the only value that the nitrogen determination would have in my view.

8985. Would you allow that they might represent figures which would enable the milk to pass a high standard, but which would not make it genuine for all that?—Supposing you fix the standard at 8·5, and he finds by estimating the nitrogen that the thing is adulterated, it would be very awkward in case that came into Court.

8986. You mean he had better pass it as genuine?—Yes.

8987. Then you would allow that analytically the addition of separated milk cannot be stopped?—I do not think it can.

8988. Nor can the addition of a certain amount of water?—No, I am afraid not.

8989. In that way you agree with the President that practically 5 per cent. of water can be added?—There is no doubt about it.

8990. And 20 to 30 per cent. of separated milk?—Yes, that is the case whether you determine the ash or the nitrogen or anything else.

8991. You do not see that by the addition of any provisos as to the contents of nitrogen or ash you would limit the possibility of error?—I do not think it would affect it very much.

8992. Do you think it would be possible at all to state an addendum to the present standard of the Society of Public Analysts to enable it so to be put that if the milk gave over 12 per cent. of solids it should necessitate there being more than 3 per cent. of fat?—In order in that way to avoid the addition of skim milk?

8993. Yes?—I think it would be very dangerous, because you might have a perfectly genuine milk with 9 per cent. of solids not fat and 3 per cent. of fat quite easily.

8994. But those same figures might be produced by a rich milk to which separated milk had been added?—Yes.

8995. You do not see your way by analytical means to check it?—No, I do not. I think the suggestion Professor Thorpe mentioned of using starch in some form is, if I might say so, an excellent one for ear-marking the separated milk. I think that is better than the addition of any salt or chemical, but I would suggest that it should be added in the form of a paste or a solution so as to avoid any separation of the granules.

8996. (*Mr. Cowan.*) Do you think the quality of milk has deteriorated or improved in your experience?—In my experience there has been no serious alteration in the quality of the milk. I can only go back eight years—to 1892.

8997. Did you hear Mr. Fisher state that he thought it was unnecessary to have a standard for separated milk?—Yes.

8998. Separated milk has already a commercial value, and I have no doubt that when it is distinguished and sold altogether as separated milk it will become more used—and it is a very valuable thing even on the farm now?—Yes.

8999. Then would you advise a standard for separated milk, that is in solids, so as to prevent separated milk even being adulterated by the addition of water; would it be necessary, do you think?—I think it might be. In that case I should make the standard for solids not fat as high as 9 per cent. If the fat is well removed from genuine milk the solids not fat are raised to as nearly as possible 9 per cent. That would be quite a fair standard—in fact, I have adopted the standard of 9 per cent. myself in samples of separated milk that have been brought to me.

9000. Have you had separated milk brought before you in order to test for adulteration?—Yes, several times.

9001. What percentage of additional water can you detect in separated milk?—About the same that you can in the ordinary milk, only you must assume a higher standard in the case of the separated milk; you must come up to 9 instead of 8½.

9002. Could you detect 5 per cent. of added water?—No, not satisfactorily, certainly.

9003. (*Mr. Farmer.*) You heard Mr. Richmond say that yesterday quite half of their farmers were down as low as 3 per cent?—I do not know that he quite said that; he said that half were below the standard of 3·25.

9004. Possibly that was so, but you heard him say that during the months of May and June a large proportion of their best farmers approached 3 per cent.?—Yes. All I can say is that my figures, which are very extended, do not bear that out.

9005. Have you ever analysed any samples of milk as they come from the farm?—Occasionally as they come from the company; in fact, many times as they are supposed to come from the farm.

9006. Direct from the farm?—No, only on a few occasions where I have had samples taken myself direct from the cows.

9007. You say you do not know whether they are morning milks or evening milks?—Those I examined I knew, of course; but I do not know whether the ordinary samples as they come to me are morning or evening milk.

9008. Would you draw the inference that this large number of samples which Mr. Richmond refers to are from bad farmers or inferior milk for the time of the year?—They are certainly inferior milk.

9009. Inferior milk for the months of May and June?—Yes.

9010. You are of opinion that they are?—Yes.

Major Charles Edward Cassal, called; and Examined.

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9011. (*Chairman.*) You are Public Analyst for Kensington, St. George's Hanover Square, Battersea, High Wycombe, and the County of Lincoln (administrative counties of Kesteven and Holland, Lincolnshire), and District Agricultural Analyst for the administrative county of Kesteven, Lincolnshire?—I am.

9012. And you are a Fellow and Past Censor of the Institute of Chemistry of Great Britain and Ireland?—Yes.

9013. Joint Secretary of the International Commission on Adulteration, a Fellow of the Sanitary Institute of Great Britain and of the Chemical Society of London, and you were for several years Chief Demonstrator in the Department of Hygiene and Public Health at University College, London?—Yes.

9014. And you have had in consequence considerable experience of the questions which we are now considering, and I believe you have come here to give us evidence on behalf not only of yourself, but also on behalf of the Vestry of Kensington?—That is so.

9015. Perhaps you would kindly state to the Committee what your views are with regard to these particular matters?—It might be convenient if I stated at once that I appear in the first instance to give evidence on behalf of and by the instructions of the Vestry of Kensington, in so far as the fixing of a standard for fat and the fixing of a standard for non-fatty solids for milk are concerned. The Sale of Food and Drugs Acts have been for many years administered with considerable energy and effect in the district controlled by the Vestry of Kensington, and much experience in the working of the Acts and in regard to the character of the articles sold has thereby been gained. Since the year 1885, 500 samples of all kinds have been taken for analysis per annum, of which about 200 per annum have been samples of milk. After a careful consideration of the subject, the Vestry have instructed me to state that they are in favour of fixing the standard for fat in milk at not less than 3 per cent., and of a standard for non-fatty solids at not less than 8·5 per cent. The Vestry instruct me to state that they are aware that these standards are low, and that their adoption will allow of the sale of a certain amount—probably a very considerable amount—of milk which has been purposely prepared to pass these standards, but they do not under all the circumstances see their way to recommend the fixing of higher figures as standards at present in view of the possibility that injustice might thereby be done to honest producers and vendors. The Vestry consider that the fixing of lower standards than those mentioned would be most harmful. That is the position of the Vestry of Kensington, practically, and that is what I am specifically instructed to put before you. But in a general sense I am also instructed to put certain considerations before you on behalf of the Vestry and to put my own views as a public analyst before you. I have thought it necessary to make that explanation, so that my position may be defined. Perhaps, as I have been in the room for some time and have heard the evidence of the President of the Society of Public Analysts, and of one of the secretaries, I think I ought to state that although I am a member of the Council—in fact, I am at present one of the Vice-Presidents of the Society—I do not wish to be taken as agreeing with the whole of the statements that have been put forward. I am not, in fact, representing the majority of the Council of the Society of Public Analysts before you. Under the provisions of the Sale of Food and Drugs Acts public analysts are required to report whether the articles submitted to them are "genuine" or "adulterated." In order to carry out this requirement public analysts have been compelled to make definitions and to establish standards. These definitions and standards have been necessarily based upon the available information as to the normal composition and characters of these articles when in such condition as to preclude the possibility of their having been tampered with. Much difficulty has been caused by the fact that different meanings are attached by different persons to the terms "genuine" and "adulterated," and at the present time the meanings which can be attached to these terms when used in the administration of the Acts are not clearly appreciated. It has been very generally assumed that any fluid drawn from the udder of any cow is, by the fact of its origin, to be regarded as "genuine," whatever condition the cow might have been in and whatever may have been the quantity and quality of the food of the cow. Such a contention is untenable, and it should be plain that the term "genuine" should be restricted to milks the composition of which falls within the well-defined limits which have been arrived at by repeated analyses of the normal fluid obtained under normal and healthy conditions. The thousands of analyses which have been made and the results of which have been published are amply sufficient to show between what limits the composition of milk which can be regarded as "genuine" varies; and the standards to be fixed should be based upon this information, with a due regard to what the purchaser expects to get, and is entitled to get, when he asks for milk. I am of opinion and my authority is also of opinion that the producer of milk, like the producer of any other commodity, is bound to take all the steps that are known to be necessary in order to produce an article having such a composition as to justify the application of the term "genuine" upon the lines I have mentioned. I am personally of opinion that the production of a milk of inferior quality, or of a fluid having the composition of a milk which has been tampered with, through improper or insufficient feeding, should be regarded as an offence similar in character to the deliberate adulteration or sophistication of the milk itself. The Acts of Parliament relating to adulteration clearly lay down the principle that the producer and vendor are bound to supply the article asked for, and having the normal composition of such article, and that the absence of knowledge and experience on the part of the producer or vendor is no excuse for the supply of an abnormal article. This is the principle which is acted upon by the authorities with which I am connected in the cases that they take into court. For example, in the case of "Dyke versus Gower"—which, I may say, was a case that came before the High Court, in consequence of the action of one of my boards, the Vestry of St. George's Hanover Square—in this case (in which a vendor, who had been prosecuted for selling milk deficient in fat, pleaded that the deficiency was due to the rising of cream in the counter-pan, whereby impoverishment of the milk left after the upper portion had been sold was caused), it was held by the late Lord Chief Justice that it was the business of a milk vendor to see that the cream in his milk was equally distributed throughout the bulk, and that if he did not see to this he was responsible for any deficiency, and might be punished acordingly. I am personally of opinion that a higher standard might be fixed for the amount of fat in milk without danger of any serious hardship being inflicted, and I consider that 3·2 per cent.—I have put 3·2 in my proof, but after hearing what Mr. Bevan stated I am quite prepared to say 3·25, because the difference is not worth considering—that 3·2 or 3·25 might be laid down as a minimum figure. I would point out that analytical figures in respect of such products as milk, condensed milk, and cream, are not absolute and that they depend of course—the Committee no doubt know this very well—to some extent on the processes of analysis employed. The progress of analytical science may make it necessary to alter in the future any standard which may now be fixed, and provision should be made to allow of this being done. I am instructed by my Board to put that matter particularly before the Committee, as they feel that the standards should not be so established as to be rigid—that it should be possible in case of necessity to alter them in the future.

9016. (*Professor Thorpe.*) May I point out that it is only by regulation of the Board of Agriculture?—Quite so.

9017. That was purposely put in the clause with a view that from time to time these regulations should be revised?—Yes, I presume so.

9018. Whilst the general provisions of the Act remain the same until altered by Parliament, the regulations are altered from time to time at the discretion of the Board?—That is quite as I understand it. Several members of my Board were, however, apparently afraid that if standards were once fixed it would be exceedingly difficult to get them altered, and that was the reason, probably, that I was instructed to put that point before you. It will be noted that a public analyst is not bound, legally, to make use of any particular process of analysis, and that the standards which it is proposed to fix relate to processes which are now very generally employed, but which

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may not be adhered to permanently. With regard to cream, the fixing of a standard for the fat in cream is a matter of very great difficulty in consequence of the great variation in the composition of products to which the term "cream" is applied. Some large vendors—and particularly one large vendor in one of my districts—stipulate that not less than 40 per cent. of fat shall be present in the cream supplied to them by the producers. This limit, which may certainly be regarded as a fair, and by no means a high one, in so far as thick cream and clotted cream are concerned, need hardly be taken at present to apply to all cream. A standard is, however, necessary, and I consider that no article should be sold as cream which does not contain at least 25 per cent. of milk fat. With respect to condensed milk, regard must of course be had to the degree of condensation which the original milk has been subjected to. In my opinion the extent of condensation may be most conveniently determined by the percentage of ash. In cases where the condensation and subsequent admixture with sugar, or otherwise, have been such as to produce an article containing 2 to 2·2 or 2·3 per cent. of ash the percentage of fat should not be less than 9 per cent., which may be taken as a low standard. With regard to the extraneous matter which is mentioned in the reference to the Committee I consider that the admixture of any extraneous matter with milk or cream should be absolutely prohibited. If absolute prohibition is held by the Legislature to be impracticable under certain conditions, then the fullest disclosure to the purchaser should be made compulsory. In regard to the condensed milk the presence of sugar and its amount and character should be compulsorily disclosed, and sweetened condensed milks should be sold as "condensed milk with sugar," and not as "condensed milk." I have dealt with the subject of preservatives and colouring matters in the evidence which I gave to the Departmental Committee of the Local Government Board appointed to consider this subject, and I have not thought it necessary to trouble the Committee with any points under that head.

9019. (*Chairman.*) I should like to ask you, with regard to your own views as to the limit of fat in milk which you think ought to be fixed at 3·25, have you arrived at that conclusion in consequence of various analyses you have conducted in your character of Public Analyst?—Yes, that is so.

9020. Have you any table to show that?—I have not drawn out a table, because as a matter of fact it would have involved a great deal of work, and, to tell the exact truth to the Committee, I have not had time to do it, but I may say that as the result of a very large number of analyses of milk submitted to me in the ordinary way under the Sale of Food and Drugs Acts by inspectors, I have come most decidedly to the conclusion that it is perfectly easy to supply London districts, at any rate, with milk containing 3·25 per cent. of fat throughout the whole of the year, and having regard to the definition of the term "genuine" which I venture to put before the Committee. I think that legislation or orders should not be directed to the relief of persons who are not able to supply the article asked for in consequence of bad feeding of cows or inferior cows, or for any other reason of that kind; but that it should be directed to the protection of the consumer, and to ensuring that the consumer shall receive an article which has a passable composition. That can be done without, I think, any difficulty. In further answer to your question I may say that for many years I have been in the habit of distinguishing between the qualities of the milks that I report upon. I distinguish between milk of good quality, milk of fair quality, milk of poor quality, and milks which I report as inferior, and with regard to which actual adulteration cannot be certified. Any milk which, according to the modern analytical processes, does not yield 3·4 per cent. of fat I certify either as genuine but of poor quality, or as inferior if it falls much lower. Putting it differently, the milk in order to be reported as of fair quality must approximate to 4 per cent. of fat—that is to say to at least 3·8—or between that and 4·0 or even 4·0. Speaking generally from my results I have come to the conclusion which I have mentioned that there ought to be no difficulty in reaching the standard of 3·25 all the year round.

9021. Have you anything to say as regards the solids not fat? What do you consider should be a fair standard fixed there?—I think the standard should be not lower than 8·5, and that that is a reasonable one to take. A public analyst should not at present advise his authority to prosecute in the case of milk which is found to contain 8·4 or 8·35 even of non-fatty solids. As a matter of fact, the authorities with which I am acquainted do not prosecute in cases of that sort.

9022. (*Professor Thorpe.*) Is that irrespective of the fat?—That is irrespective of the fat.

9023. You might have your poor minimum of 3 per cent. of fat with 8·3 of non-fatty solids; would you then take action?—No, the authorities would not take action in those cases, no doubt largely because they think that probably they would not be successful, and they do not want to go to the expense of fighting cases which would result in defeat. But as a matter of fact, if for instance a sample of milk is reported as containing 3 per cent. of added water, which would be upon 8·24 solids of fat, my authorities, certainly two of them—Kensington and St. George's Hanover Square — would merely caution the vendor, send him a cautionary letter, and have further samples taken from him; watch him in point of fact. In Battersea, the vestry have occasionally begun prosecutions on percentages as low as that, but they have not been successful, and I do not think they will do it very often in the future in view of the objection which public authorities have to undertaking prosecutions which will probably result in failure.

9024. (*Chairman.*) What would be your duty as a public analyst, supposing the limit is fixed for non-fatty solids at 8·5, and you have got a sample of milk with 8·3 or 8·2?—Supposing that that were the case, I should certify it as adulterated, but I should not advise prosecution. Of course it is quite possible that the authority may not accept my advice and would prosecute; but I should do that, because there is no option—one must certify adulteration if you have got a standard of 8·5 fixed, and having regard especially to the section in the new Act, that it is a question of presumption until the contrary is proved; that is to say, it does not necessarily mean that you are accusing the man of having committed an offence, and certifying adulteration, if he can prove that the article is not adulterated. I think one's hands are freer than under the old Act.

9025. You say yourself you would like to see a standard fixed to assist you in the execution of your duties?—Undoubtedly.

9026. And the limits you suggest are 3·25 for fat and 8·50 for non-fat?—Those are my personal suggestions; the Kensington Vestry's suggestions are slightly lower for the fat; 3 per cent. they suggest.

9027. As regards cream, do you think there ought to be a standard?—I think there ought to be a standard.

9028. You do not think that cream is a thing which could manage itself, in the same way that blacking or ink manages itself; if a customer is not satisfied with what he gets he makes expostulation, or goes to another dealer?—No, I do not think that the question should be left there. I think as a matter of fact that there should be standards for almost everything; and I can see no reason why there should not be a standard for cream. It appears to me that not only may the purchaser be defrauded if he wants an article containing 25 or 30 per cent. of fat, and he gets an article containing 15, but also the vendor who sells a cream containing 30 or 40 per cent. of fat is treated unfairly if his next door neighbour sells as cream an article which contains only 15 per cent. of fat, and makes an undue profit out of it.

9029. Does not the customer, do you not think, see to it? If he finds he has been badly treated in one shop he goes to the next, where he will be better treated?—I do not think that one can, in matters of adulteration, rely upon the discrimination of the customer. The Legislature is paternal as far as adulteration is concerned.

9030. (*Professor Thorpe.*) I think that is rather an essential point. I think there is an essential difference between the cases of milk and cream in this respect: the Legislature and nobody else wish to interfere, I presume, with the free play of competition if it can be allowed to play without being hampered by restrictions of this kind. In the case of cream competition certainly has free play, and apparently experience seems to show, if I may go back upon the evidence which was given here this afternoon, that there has been no urgent demand for any interference. It seems from the evidence we have had from the President of the Society of Public Analysts that the society, as a society, has not been called upon to take any action with respect to this; that they get very few samples brought to them, comparatively speaking, and that there is no urgent public demand. That would seem to show, therefore, that the public thinks it can protect itself. Is that not so?—

No, I do not agree with that evidence. As a matter of fact, I do not think the fact that the Society of Public Analysts has not dealt with the subject affords any evidence that samples of cream—and large numbers of samples of cream—should not have been taken, nor do I think that it indicates that there has not been a demand for it in the sense that the public interest has not required it. The system of taking samples is, in nearly every instance throughout the country, so haphazard, and is left so much in the hands of people who ought really to be under control and who are not, that I do not think one can draw any very definite conclusions from the fact that comparatively few samples of cream have been taken. If samples of cream had been taken in large numbers I think the matter would have been forced upon the attention of the public authorities, and it has depended merely on the fact that the inspectors have not taken samples of cream that the thing has not been dealt with—not, I think, because there has not been a demand for it in the sense I have indicated.

9031. But surely the inspectors have acted in accordance with public pressure, or the pressure of public opinion?—The pressure of public opinion with regard to adulteration has not been really as severe as might have been desirable.

9032. In the case of milk it obviously has?—In the case of milk, yes; but that is so largely because milk was the first article to which attention was particularly drawn when the Adulteration Acts came in, probably because it is an article which is so very easily adulterated. I do not think that the taking of the large number of samples of milk is due so much to the pressure of public opinion as to the fact that it is an article which is easily adulterated. Of course, that is a matter which might be discussed to any extent, but I must say I do not think the reason given for the absence of the taking of many samples of cream—that it is due to want of desire that such samples should be taken either by public authorities or by the public—is correct.

9033. (*Dr. Voelcker.*) Is there not a great difference between cream and milk in this respect—that a man who supplies milk knows very fairly what the quality of that material should be, and if he keeps his cows properly and feeds them properly he has no difficulty in getting milk of that required quality; but in the case of cream which is produced by a separator a man has no means of knowing what the quality of that is? It depends very much upon the running of his machine, and he cannot check that—there is no ready test for it. It seems to stand on a different footing altogether, and is not under the control of the person producing it in the same way as the production of milk is? That seems to me a great difference?—No doubt there is a difference, and I quite admit there is a difference; but I do not agree that, because the vendor has not got the appliances, or has not got the means, or does not take the trouble to ascertain the nature of what he is selling, that therefore he shall be excused. There is a certain amount of seriousness, I may mention incidentally, which may attach to the supply of inferior cream, in that—although it is not a question that I perhaps ought to deal with—it is now being used as a substitute for codliver oil, and for the purpose of enriching milk for children. That question came up, possibly Dr. Volcker may remember, in connection with the adulteration of cream with boracic acid. But I hold that the person who sets up as the vendor of an article ought to know his business, and to be in a position to ascertain that he is really supplying that which is asked for. No doubt there is more difficulty about it in the case of cream.

9034. (*Chairman.*) I should have thought there was less difficulty about producing good cream than good milk. The production of good cream is a mechanical process, and it depends entirely on how you set your separator?—Quite so.

9035. (*Mr. Farmer.*) Do you not think the reason you have never had any samples of cream taken is that, if they were taken and analysed, you have no means of certifying whether they are adulterated or not? There is no such thing as adulterated cream?—There is, of course, so far as concerns gelatin and things of that sort, and also preservatives; but so far as the percentage of fat is concerned that is quite true—there is no standard to go upon. I could not certify that a sample of cream was adulterated if I found 15 per cent. of fat in it, because, of course, there is no standard. I might, however, do what was originally done in the case of milk, and in the cases of many other articles of food—I might say to my authority that in my opinion there ought to be 25 per cent. of fat in cream, and I might persuade them that this was so, and then they might take proceedings and endeavour to show that that was the case, and thereby a standard would possibly be established. But it is quite true that at present we have not got a legal standard, and we should have either to get one from such a Committee as yours or to establish one by a fight in a court of law.

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9036. (*Chairman.*) Is it wanted?—I think it is. I think there ought to be some check upon the person who sells cream containing 15 per cent. of fat when it is perfectly well known that the article to which the term "cream" can properly be applied contains at least 25, and when it is thick will contain 50, or perhaps 60 per cent., in some cases, of fat.

9037. It is a different class of person who purchases cream from the ordinary purchaser of milk?—The milk standard is really for the protection of poor people rather; it is rather a wealthier class that buys cream.

9038. If the purchaser cannot get the class of cream he wants he does not bring the case into Court. He simply leaves his tradesman and insists on a higher quality?—Yes, no doubt that is so.

9039. (*Professor Thorpe*). There is another consideration which perhaps is not present to the mind of Mr. Cassal, but certainly is present to the mind of this Committee, who have heard all the evidence—namely, that we shall have, in dealing with the question of cream, to deal with several local customs which we do not wish to disturb, and which there is no necessity to disturb. In the City of Glasgow, for example, there is a perfectly legitimate use made—and it is sold very largely—of this low-quality cream. There has been no public cry and there has been no public pressure for this in any way to be altered; indeed, we have had several persons from Glasgow who have pointed out to us what a hardship it would be if we insist upon a high standard for what we should regard in England as cream, when there is a large class of persons who do not wish to use a high quality cream. A considerable amount of porridge is eaten in Glasgow, and people are in the habit of buying what is really milk containing a somewhat larger quantity of fat for the purpose of eating with their porridge, or, in some cases, of drinking in their tea. There does not seem to be any public demand on this side of the border to trouble with the question of cream, and if we were required to fix standards for it we should certainly be causing trouble on the other side of the border?—I quite see the difficulty, but I rather think the mere fact of a product of that sort being sold, indicates to my mind the advisability of some sort of control being exercised.

9040. (*Dr. Voelcker.*) We have had it in evidence that the poorest classes use it?—I suggest you could get over that by instituting certain names for these different products; you might say that it should be "double cream"—or any other name that you like to apply to it—which would indicate that this sort of thing should contain so much fat; that "half cream" or "thin cream," or any other name you like to apply, should contain so much, and that the product referred to by Professor Thorpe should contain so much. These things should have standards fixed on somewhat the same lines as those on which the differences between "separated milk" (which is machine skimmed milk), and "Skimmed Milk" and "Milk" have been laid down in the recent Act.

9041. Apparently in these places they have got already their own names without our giving them any, and they grade themselves according to the wishes and habits of the people; it is done already, and it is a question of price. However, we are very glad to get your views on the subject?—I think there is perhaps a little misunderstanding. Dr. Voelcker asked me just now about the difficulty with cream. What I think he meant was to imply that it is more difficult perhaps for a vendor or a purchaser to arrive at an accurate knowledge of the composition of his cream than it is to arrive at the composition of his milk.

9042. I meant that?—With regard to that, that is largely due to the fact that much more attention no doubt is being paid to the examination of milk than to the examination of cream; and that, very unfortunately as I think, analytical data and analytical figures and analytical processes have been dragged about in courts of law with very disastrous results to the legal persons concerned, and, I think, also to the public interests erroneous notions having been produced in consequence.

9043. (*Professor Thorpe.*) Have you any advice to tender to us as to whether we should be wise, assuming we do recommend standards, to recommend a standard

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based upon an aggregate solid content of the milk with a limitation as to fat, or whether you would suggest that the limit should be based upon solids not fat and fat?—I should suggest the latter. I agree with what Mr. Bevan said about that. I think it is distinctly desirable that there should be two standards, one of solids not fat and one of fat. It is clearer, it is decidedly safer, and it would be far better in regard to the conducting of legal cases, I think.

9044. I particularly asked the question, because, of course, we are face to face with the possibility of having to consider a variable amount of fat during the year, and it certainly would simplify the procedure if we could take an aggregate amount, because in general, of course, the one thing compensates for the other. That is the general tendency; I do not say it is universal, but in the greater number of cases it would be found that, assuming the milk to be perfectly genuine, a low percentage of fat is accompanied by a relatively higher proportion of non-fatty solids, so that in that way we might evade the difficulty of having a variable standard depending upon the season of the year?—I am very much afraid that it would result, if that course were adopted, in still more confusion than at present exists in legal cases. It is one of the great difficulties in the administration of the Acts that in police-courts and so forth you have scientific facts, sometimes of a very abstruse character, bandied about by people who really have not got the slightest notion of what they mean, and, what is sometimes still worse, bandied about by people who have got a very slight notion of what they do mean, and who imagine that they have got a knowledge of the whole subject. That is a still more dangerous condition of things. Personally, I very much regret that these figures have been allowed to become such common property. I think it has done a good deal of harm, especially as the machinery exists which would prevent injustice being done, in that a public analyst, who is presumably a responsible officer, is appointed to analyse samples, and he reports and issues a certificate with the full sense of his responsibility—a responsibility which, I think, Mr. Bevan has this afternoon very clearly and properly indicated—in addition to the fact that if the vendor is dissatisfied he has an opportunity of appealing to the central authority at Somerset House. My own view is that when the public analyst has said that the sample contains, say, 10 per cent. of added water, the vendor has his remedy by going to Somerset House and asking whether they also find 10 per cent. of added water. This, it seems to me, would be really all that is required without having these questions of non-fatty solids, nitrogen, proteids, and ash fought out by a lot of more or less ignorant people.

9045. Pardon me; it is inevitable that they should be divulged, because when the certificate of the public analyst is challenged by scientific evidence for the defence, everything turns upon the analytical data, and it is inevitable, therefore, in cross-examination, that the facts upon which the deduction is based must come out?—Yes, that is true. I should also add, a great deal also turns on whether the learned magistrate understands what it is all about. In the great majority of cases, with all respect to the Bench, and with certain brilliant exceptions, I venture to think he does not.

9046. I am afraid the limits must make their appearance somehow?—I think, of course, that it cannot be helped now—the matter has gone too far; but in pressing, as I have in the past pressed, at the Society of Public Analysts and elsewhere as far as possible for the prevention of the vulgarisation of analytical data, I have ventured to point out that what has occurred with milk may occur in the future with other articles—butter, for instance—and that we shall have Reichert figures, refractometer indications, and Valenta tests, and the rest of these matters that are still more recondite than those dealt with in the analysis of milk, also dragged into the police-courts to the confusion worse confounded of the legal gentlemen who have to deal with them. That is a danger, and every argument that has been used in favour of putting forward the analytical data upon which analysts base their conclusions in the case of milk can be used with equal effect and equally justifiably with respect to butter, cheese, coffee, or anything else.

9047. There is no abstract reason why they should not be?—Then an additional terror would be added to the duties of public analysts.

9048. (*Chairman.*) You have already told us that you think the standard ought to be fixed?—Certainly, but I also think if it were possible that it should be a standard to guide the experts who are concerned with the matter, and that the people who are not experts should take their directions from those who are—from public analysts in the first place and Professor Thorpe next in case of appeal. I think some questions came up about condensed milk; it has occurred to me since I have been in the room that this might be done with regard to the labelling of condensed milk. I may just mention that the difficulty is the question of concentration—I think Professor Thorpe raised that point. It might be got over by labelling condensed milk with the degree of concentration. You might require the sale of "Double condensed milk" or "Triple condensed milk," as the case may be, and require that the article should come up to the statement on the label, because there is nothing at present to prevent a man from selling as condensed milk an article which has only been in the result condensed to half its bulk, whereas as a matter of fact in the case of sweetened condensed milks the concentration is very much greater, and results in a concentration to a third. In the end the actual concentration of the milk itself is greater because you have to consider the dilution with 40 or 50 per cent. of sugar. As to the methods of determining fat, which I have heard mentioned—I see Professor Thorpe takes a great interest in the point—I may say I am one of those who do not use the Adams process. I was rather surprised to hear what Mr. Fisher said about that. I was not present at the Council meeting where this matter was dealt with, but I was surprised to hear that so many members stated that they still made use of the Adams process. No doubt with considerable precautions it is a very good process as long as it works properly, but it requires considerable precautions to make it work properly. Personally, I consider that the modification of the Werner-Schmidt process, which involves the complete removal of the ethereal solution of the fat and the weighing of the fat, is probably the best process that we have up to the present.

9049. (*Professor Thorpe.*) Am I correct in the assumption that I base upon the information that I have received, that the Adams process is not generally employed by the analytical profession?—I do not know that as a fact I can only say that I was much surprised to hear what Mr. Fisher said on the point, and I do not believe that the members of the analytical profession who have a great number of milks to do use Adams process. That is my view of the case. If they do, I think they are making a mistake.

9050. As the central authority I may say that probably we come in connection with a larger number of analysts than perhaps any analyst himself may come?—No doubt.

9051. We have got information as to the method which they do employ—in many cases they have been good enough to tell us, and the assumption I make is based upon that information which I have received?—Yes.

9052. (*Dr. Voelcker.*) You were speaking of it as a general process just now?—How do you mean?

9053. You say they do not as a general rule use it?—I do not think so.

9054. Are you referring to the process in general or to the cases that are being reported upon for prosecution?—I should be very much surprised to hear that in cases which are going for prosecution the majority of public analysts make use of the Adams process—I very much doubt it——

9055. (*Major Craigie.*) On that point of condensed milk to which you have alluded, have you had any recent prosecution in either of your vestries since the passing of the present Act on the subject of the marking of condensed milk, of which analyses have been made as condensed milk?—There have been no prosecutions for abstraction of fat; there have been one or two prosecutions in St. George's, Hanover Square, for improper labelling and the non-appearance of the vendor's name and address on his can or cart.

9056. Quite recently?—Yes, quite recently.

9057. In those cases have you had occasion to observe what the percentage of fat was in the condensed milk?—Yes.

9058. Could you give the Committee any idea of the sort of percentage?—Yes, I can. I was not present in court, as it was considered that the question of analysis did not affect the matter at issue, but as a matter of fact I had certified upon those samples of which, if I remember rightly, there were three. One was certified to contain 97 per cent. of sweetened condensed milk devoid of fat, which is the same thing as saying that the milk had 97 per cent. of the original fat abstracted; and the other two were certified as containing 87 per cent. of sweetened condensed milk devoid of fat, which is equivalent to saying 87 per cent. of the original fat abstracted. Perhaps this form of statement may strike the Committee as somewhat cumbrous, but I may say I have been led to use it by the pressure of legal opposition. The legal gentlemen who appear to defend in these cases insist upon having what they call the "parts" of an article, and in order to do that this method of stating the results is satisfactory.

9059. In those cases of condensed milk, were they labelled to show that they were not made from whole milk?—I have not the facts with me, and I am not able to specifically state the circumstances.

9060. (*Professor Thorpe.*) Are you able to tell the Committee the brands of the condensed milk?—I cannot to-day; I can give that information to the Committee subsequently if the Committee wish to know it.

9061. (*Chairman.*) And the results of the trials?—I should like the Committee to allow me to get the exact facts, because I am only speaking from memory. My impression is there were convictions on each case, but it is only an impression; it has not come before me officially. The matter is not one which was really an analytical question.

9062. (*Major Craigie.*) They were cases under Section 11 of the new Act, were they?—Yes, they were. If the Committee wish it, I can obtain the exact facts and send them to Mr. Rew.

9063. (*Professor Thorpe.*) It would be desirable. I believe they were almost the first cases under the new Act?—I think they were. I will have the whole of the facts sent to the Committee. (*See Appendix XXVI.*)

9064. (*Dr. Voelcker.*) You have had to do with other districts than those round London, I believe?—Yes, I have.

9065. You mentioned that as far as London was concerned there ought to be no difficulty in getting 3·25 of fat in the milk; do you imply that it would be difficult in the country or not so difficult?—I think it might perhaps be a little more difficult in the country, because in the country places you have milk supplied perhaps from single cows by small vendors, and of course, as is well known, the milk of single cows is apt to vary very considerably; but I do not think even if a standard were universally adopted it would inflict any hardship, because there is always the opportunity for the vendor to show that he is guiltless.

9066. The divergence of views between yourself and your Vestry is perhaps but natural—we know that on a vestry you have people who have trade interests, and who are a little afraid of their being attacked?—That may no doubt have something to do with it. The tendency is to be lenient, of course, although perhaps I may say that at Kensington a prominent member of the Committee which deals with these adulteration questions, and who is a very highly and properly respected member, is a large milk vendor, and he is very strongly in favour of having nothing less than the 3 per cent. standard for fat and 8·5 standard of solids not fat, but he is not in favour of my view of 3·25. Still, I think that possibly your suggestion may have something to do with difference of views between authorities and their public analysts in some districts.

9067. I think, with some knowledge of Kensington myself as a resident of it, I can say that your own activity there has somewhat worked up the Vestry to a sense of its duties in this respect, and has rather caused them to raise the standard than lower it?—Possibly there may be some truth in that.

9068. Do you think if energy is continued to be directed to this question, in Kensington at least, the standard of 3·25 would be a benefit to the public and to the producers too?—I think so, undoubtedly.

9069. The points on which you do not agree with the representative of the Society of Public Analysts are mainly the ones you have just indicated?—Mainly.

9070. In general you are in agreement with them?—I am in agreement mainly with what Mr. Bevan has said.

9071. As representing the views of the minority of the then Council?—Yes.

9072. Do you think the majority of the members would rather favour the adoption of a 3 per cent. standard?—I may say as a Vice-President of the Society and as sometime Secretary of it, I am pretty well satisfied that if this question were put before a representative meeting of the whole society, we would have no difficulty in carrying a resolution—probably by a large majority—in favour of the higher standard; I have very little doubt about it.

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9073. And that a standard of 3·25 of fat and 8·50 of solids not fat would be the one most generally acceptable?—I think so; I think if the matter were thoroughly threshed out before the Society of Public Analysts that conclusion would be come to.

9074. Is there only a difference of opinion as to a statement in the terms Professor Thorpe mentioned just now, namely, total solids so much, a certain amount being fat? Is there much divergence of opinion as to the advisability of one or the other form of stating the standard?—I am inclined to think—of course, I am influenced in that by my own opinion—that most public analysts who have much experience in law courts would take the view that the two standards would be desirable.

9075. But the statement of total solids including the fat would give a wider range?—It would give a wider range no doubt, but I do not think that much benefit would accrue from it. I am afraid of it rather, for the reasons I have mentioned.

9076. You have had considerable experience with your local bodies; do you think that it would be as well understood by them?—No, I do not think it would. I think the two standards would be far clearer to the local bodies, as well as to the persons concerned in administering the Acts.

9077. Would not the statement of a standard in terms of the fat and solids not fat imply to their minds that under all circumstances each of those must be kept up to?—Yes, no doubt it would.

9078. Which the statement in the other form would avoid to a certain extent?—It would avoid that, of course, but if you had a standard of 12 per cent. of solids, of which three must be fat, it would probably result in its being assumed that you would fix a standard of 9 per cent. of non-fatty solids.

9079. People would assume that?—Yes, I think that is very likely what would happen.

9080. You might make use of the freedom which you as public analysts have to advise your authority to prosecute or not?—Yes.

9081. Does your authority come to you for advice about the steps they should take?—Yes, frequently. In London that is especially the case. In my own districts and in others with which I am acquainted the public analyst is present at the meetings of the Committees which deal with these questions, and although he has no business to give advice unasked, it is very generally the case that he is asked whether he considers that in a particular case a prosecution should take place.

9082. The local bodies, as a matter of fact, do rely very much upon the opinion which the public analyst gives?—They do where the public analyst is in contact with them.

9083. If there is a good understanding between them?—Yes.

9084. (*Professor Thorpe.*) May I put it that the theory of the position is that the authority is the responsible party in initiating the prosecutions?—That is so.

9085. And that they merely ask you for guidance upon analytical data?—That is so.

9086. Would not the necessity of that be to some extent obviated if these limitations were drawn up in the sense indicated by the terms of Section 4 of the Act—that is to say, that they would be able in the greater number of cases to draw their own deductions?—Yes, I think it would assist them considerably. There is no doubt it would, in drawing conclusions. Of course, the members of Committees which are constantly dealing with these things get to understand the subject. In St. George's, Hanover Square, there is a special committee which has existed for several years for dealing with matters under the Sale of Food and Drugs Acts, and many of the members of that committee clearly understand the meaning of a certificate, and have no difficulty in arriving at conclusions without any advice of a technical character.

9087. The effect of that would be, would it not, to take away what is perhaps a reproach, or what the outside public hold to be a reproach that the real prosecuting authority is the public analyst?—I think there is no doubt it would be an advantage if that notion, which is entirely erroneous, were taken away.

9088. But it always is, especially from the way in which

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the matters are reported, the general impression that the real prosecuting authority is the public analyst?—Yes, that is the impression.

9089. That is, of course, an impression which is not conducive to the dignity of the profession?—No; it is certainly most objectionable.

9090. (*Dr. Voelcker.*) You feel your position would be improved if you had simply to state the figures and leave other people to deal with them?—Undoubtedly.

9091. Even if you did that would not your people come to you and ask your advice?—There is no doubt they would ask advice, especially if they were new members who had not had much experience of the subject. Of course, it is advice. I need not say that the committee of a local authority, or the local authority itself, is disposed to resent anything in the nature of—I will not say dictation—but of pressure on the part of its officers, and perhaps they resent it more with the public analyst than with any other officer in most cases.

9092. Even if you gave merely the figures, and handed in your certificate, your duties would not be, even under the new procedure, at an end altogether; they might still come to you and ask you what the meaning of this was?—Yes, certainly. No doubt they would.

9093. So that your local people would still look to you for advice?—Yes, I have no doubt they would.

9094. And whether that system works well or not depends very largely upon the interest and intelligence of the particular vestry concerned?—Yes, largely, of course.

9095. You mention certain difficulties which might arise in cases where a small amount of water, say 3 per cent., is reported upon?—Yes.

9096. I think I am correct in saying that when you have made a return of 3 per cent. of added water it is by the taking of a very low standard?—Yes, certainly.

9097. And the probability is that that is nearer 10 per cent. than 3?—Quite possibly in many cases. Of course, it is taken on the standard of 8.5, which is a very low standard.

9098. Have you found in cases where prosecution has been brought on, or where it has been contemplated, that a difficulty has arisen because of that low standard, and that small amount of reported adulteration?—In what sense do you mean?

9099. When you have reported only as little as 3 per cent. of water added, because you were obliged to take a low standard, has it been asserted that it was a ridiculous prosecution?—Frequently, indeed constantly when there have been prosecutions in such cases. There was a case, I may mention, which occurred a fortnight ago in Battersea, where the authority prosecuted in a case where I had certified 2½ per cent. of added water. I was not present at the meeting of the committee when the case was considered. I may say my advice was not sought on the point, and they decided to prosecute. This case was heard, and the defending solicitor, who is very well known in connection with those cases—Mr. Ricketts—who met me as I was going to the courts about some other cases, said: "Oh, your case of 2·5 has been laughed out of court; the magistrate would not listen to it—an absurdly low amount; and I ought to have had costs, but I did not get them."

9100. Have you not practically been obliged to report a very much lower proportion of added water, because you would be met at once by evidence or by the arguments of legal persons, to show that you could not prove a higher adulteration?—Yes, of course that has been the case; that has resulted in the necessity of taking the standard of 8·5. I may say that the case which has been mentioned here—the case of "Fortune v. Hanson"—is a case which has had considerable effect in this direction. The courts in consequence of the decision in the case of "Fortune v. Hanson," which resulted in the necessity of public analysts stating in their certificates upon what figure they base their conclusions, has resulted also in the almost general acceptance of this standard of 8·5. I have no doubt the case of "Fortune v. Hanson" has been before the members of the Committee.

9101. Do you ever do such a thing as adopt a working limit which is different from the figures that have been mentioned by you as a standard?—No, I do not.

9102. In considering whether you should return a sample as being adulterated, or as being poor, or so forth, do you ever adopt a lower standard than that indicated by the standard of the Society of Public Analysts?—No, I take the standards of 3 and 8·5, determined by the methods I have mentioned. If I were to get a case of 2·99 per cent. I should probably report that sample as inferior; but I do not alter the standards, if that is what I am to gather. I mean to say my view is if once you adopt a standard you must stick to it as long as it is a standard that is based upon a particular process of analysis—I mean a reliable process of analysis.

9103. We have been told here that if a standard be fixed, whatever those figures may be—8·5, for instance, and 3 per cent. of fat—that before reporting on a case as being adulterated an analyst would have his working limit, and would not report upon a case, even if it did not go below those figures, if it came very near them?—It all depends on circumstances. I give you the instance of 2·99; there must, of course, be a certain amount of elasticity about it.

9104. I will not put it as close as that; I put it generally. If a standard of 3 per cent. were fixed would you ever go so far as to say, I will not report any samples as adulterated unless they come to 2·75?—No, I should not do that. I think now I understand.

9105. You have a working standard then as well. We have had it stated that whatever standard there is given, there will be also a working limit?—I now know, I think, to what you allude. There are one or two public analysts who have put forward the view that even if you have a standard of 3 per cent., your real standard must be 2·75.

9106. That is what I mean?—I do not agree with that at all, and I do not follow that practice. Putting it specifically, if I get a sample of milk which yields 2·75 per cent. of fat, the determination being confirmed, of course, by the two or three different processes used—by calculation and by the Werner-Schmidt—then I say that that is a milk which has had a certain percentage of fat abstracted. I do not follow the practice of having the standard of 3 per cent. based on those processes, and of then taking 2·75.

9107. You do not have a different working standard?—No.

9108. If you had a standard fixed of 3¼ of fat, and it was, as Mr. Richmond has told us, in May, a morning sample of milk, and it gave 3 per cent., you would report it as adulterated?—Yes, I should.

9109. And if your people came to you, would you move for a prosecution in it?—It is a question of amount. If the amount was low, I should not.

9110. Three per cent. of fat?—And it should be 3·25?

9111. If 3·25 was the standard, anything coming below that would, in the words of the Act, raise a presumption—if you had in May or June a morning milk giving 3 per cent. of fat, what would your action be?—I may premise there that I should not know whether it was morning milk or evening milk; I should know nothing about it; it is simply milk from the point of view of the public analyst, and if I found the standard laid down was 3·25, and the sample contained 3—that is, a loss of 0·25 on 3, which is about 7½ per cent. of fat abstracted—I should certify accordingly.

9112. You would certify it?—Yes, certainly.

9113. Then if your authority came to you and asked you whether it was possible that this was a natural milk poorer than usual in the months of May and June, would any action be taken?—Produced by a single cow and untampered with? I admit the possibility of such a thing, but I should say that the article was not of the nature and quality demanded, and that it is the business of the vendor to show that he had not been guilty of an offence.

9114. In other words, it would raise, and in your opinion rightly, a presumption that he had been?—Certainly.

FOURTEENTH DAY.

Thursday, 10*th May*, 1900.

PRESENT

Lord WENLOCK, G.C.S.I., G.C.I.E. (*Chairman*).

Mr. GEORGE BARHAM.
Mr. GEORGE COWAN.
Major PATRICK GEORGE CRAIGIE.
Mr. S. W. FARMER.

Mr. SHIRLEY F. MURPHY.
Professor T. E. THORPE, F.R.S.
Dr. J. AUGUSTUS VOELCKER.

Mr. R. HENRY REW, *Secretary*.

Mr. THOMAS WILLIAM DRINKWATER, Ph.D., L.R.C.P., Ed., called; and Examined.

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9115. (*Chairman.*) You came before us to give evidence on behalf of the Edinburgh and District Dairy Association, I believe?—That is so.

9116. You are the analyst of that association?—I am.

9117. And you are also lecturer on chemistry in the Edinburgh School of Medicine?—I am.

9118. Is your association in Edinburgh composed of the retail dealers in that city?—Mainly. There are a few wholesale dealers also.

9119. Outside your association?—No, wholesale men who belong to the association as well.

9120. Can you say that your association represents pretty well the milk trade of Edinburgh?—I can.

9121. Have they come to any resolution on this subject?—They have. The majority of them are of opinion that 2·75 would be a fair standard. But I may say that there are a good number in the association who object to any standard at all.

9122. For what reason?—They say milk is a natural product and not a manufactured article, and it varies so much that they apprehend that some of them may be looked upon as dishonest all the time that they are really honest traders.

9123. In the course of their business they must be aware that they must try to work up to some standard, surely?—Yes, they are quite aware of that, but I am afraid the standard is not always reached. They are in the hands, to a great extent, of the wholesale men.

9124. And they are of opinion that no matter what sort of stuff the cow produces, so long as it is genuine?—It should be sold as milk.

9125. However poor it may be?—That is so. That is the feeling of a certain number of them.

9126. Is that a feeling which you think is a right one?—Personally I do not; but I must mention that because it was mentioned at the meeting of the Dairy Keepers' Association.

9127. You do not think that the standard should be such that it would include the lowest class of badly-fed cows?—No, I do not.

9128. Therefore your opinion is that we should try and set a standard which could be reached by good cows, taking the average over the country?—The average over a district, I should prefer to say.

9129. We cannot look to districts so much as to the country at large, and therefore we are taking evidence from different parts of the country to see if we can arrive at a standard which shall be fair to everybody. Can you tell us the manner in which milk is supplied to Edinburgh?—No milk comes in by rail from any far distance.

9130. What is the population of Edinburgh?—I really could not say just now.

9131. It is over 200,000, I think?—Yes, it is over 200,000, but I could not give you the exact figures. About a third of the milk supply comes from farms beyond the City of Edinburgh—a distance of more than four miles but less than ten.

9132. It would come in by cart, I suppose?—It all comes in by cart, but though it comes in from a farm it is byre-fed.

9133. Is it sold warm?—Yes, it is.

9134. In fact, all your milk supply is, I believe?—Yes, I do not know of any dairyman who has a cooler.

9135. One thing about these byres, are they inspected?—Yes, they are now.

9136. Are the provisions and regulations strict as regards cleanliness and so on?—As far as I know they are.

9137. Would you say it was a satisfactory means of supplying milk?—Personally, I prefer milk from a farm.

9138. Are those byres filthy and ill-ventilated?—Now they are not. There is a special inspector for that purpose, and they are under the sanitary department of the Town Council.

9139. Are their regulations strict enough?—Yes, they are.

9140. And you are satisfied that the milk produced in those byres is a good milk to consume?—As good as can be produced in a byre.

9141. As regards the dairies inside the burgh—how many would there be?—There are about 450 dairies inside the burgh. That includes one or two wholesale men besides the retailers.

9142. What number of cows are affected by that?—The largest number kept by any cowkeeper was 180; but that is rather exceptional, and I think he is down now to about 160. None of them feed less than 20, and the average is about 40 to 50.

9143. What is the custom about calving down? Do they sell them off?—Practically all the time they are keeping the cows they are getting them ready for the butcher.

9144. They buy them in just before or after calving?—That is so.

9145. And when they dry off they sell them?—Yes, they are sold in about 10 months' time; in fact, it depends on the quantity of milk they give as to the time they sell them.

9146. Then there is no question, at all events in Edinburgh, of they themselves altering the system of breeding?—I suppose they will do in time, but it will be rather a big job to get rid of all this system at once. One or two men have retired or died, and the byres have not been reoccupied. I think the tendency of the Sanitary Department in Edinburgh is to get rid of the byres when they can.

9147. Inside the town?—Yes. I do not think any new person would be allowed to start a byre or anything of the sort in Edinburgh.

9148. In point of fact, for all purposes, that would be a good thing?—I must confess I think so.

9149. Then we may look to it in the future that the milk business of Edinburgh is likely to push the cattle out to the outside of the town?—Yes, I think it is. There will be difficulties to be met with, but I suppose they will be overcome. There is no ground near Edinburgh where milk is produced. It pays them better in Midlothian and East Midlothian to produce potatoes rather than milk, so we should rely entirely on the South-West of Scotland for our milk supply. Whether they could supply us or not is rather a difficult question.

9150. What breed of cows is generally bought?—In Edinburgh they are crosses—all of them.

9151. Shorthorns and Ayrshires?—Yes.

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9152. What do you say as to the amount of milk these cows produce?—It is rather large—$2\frac{1}{2}$ gallons; if it falls anywhere near to two gallons they sell the cow; they say it does not pay them.

9153. What price do they get for their milk in Edinburgh?—They get 10d. wholesale, and it sells at from 1s. to 1s. 2d. per gallon—that is the imperial gallon.

9154. Is there a different price for summer and for winter?—No, that is the price all the year round.

9155. And unless the cow furnishes this amount of milk it does not pay?—It does not pay. Of course, I need not draw your attention to its being a much larger yield than the English cows give in the Midlands.

9156. This large amount is produced by stimulating food?—It is.

9157. Such as brewers' grains?—Brewers' grains are used to a great extent.

9158. Do they use mangolds?—Yes, they are using them in the winter; it depends very much on the price.

9159. And swedes?—Perhaps to a small extent; I think mangolds are used more than swedes.

9160. Do they use much hay?—Very little, I might say practically none.

9161. What form of nitrogenous food do they get?—They give them a little pea meal and bean meal.

9162. No cake?—No cake; but they get nothing out of the manure practically, so there is no inducement to give them a highly nitrogenous food.

9163. Except with regard to improving the milk?—That is all.

9164. And that they do not look to?—They look to the quantity.

9165. Do they use potatoes very much?—Some of them use potatoes a good deal, I find.

9166. Do they feed them raw or steamed?—Raw, as a rule, and a good number give treacle.

9167. Treacle mixed?—Yes, and brewers' grains.

9168. No dry stuff?—No; in the summer time they will get a little cut grass and clover.

9169. Brewers' grains seem pretty constant?—That is the constant food.

9170. Whatever other food they may get brewers' grains are constantly present?—That is so.

9171. What is the result of this method of feeding?—It seems to me that you get a very large quantity of milk of a very poor quality.

9172. At what time of the year do you notice that the milk is richest under this system of feeding?—The richest milk, I find, is in the summer, which is different to the ordinary run of things.

9173. Have you got any table showing the analyses of the milk at different times of the year?—No; I have just taken out the averages and the highest and lowest in one or two points. In 1894, in July, the average was 3·2 per cent. of fat and 8·99 per cent. of solids not fat.

9174. That is an analysis of how many samples?—That is an analysis of about twenty-five samples; they were taken all the same day, or within two or three days.

9175. Taken at random over the city?—Yes, on a sort of surprise visit to the dairies. Every now and then the Committee of the Association take a number of samples in order to ascertain the quality of the milk that is sold in Edinburgh; and one man only knows what date this is to be, and he and two or three others will go round on the morning and take samples of the morning milk.

9176. This is morning milk that you are mentioning then?—It is all morning milk.

9177. Have you any statement of the lowest milks on that occasion?—On that occasion the lowest milk sample was 2·3; I cannot say whether it came from a shop or from some of the hawkers on the street.

9178. Was there anything to tell you that the milk was genuine?—No; in that case it was rather doubtful.

9179. (*Mr. Barham.*) What was the average?—The average in July was 3·2 of butter fat and 8·99 of solids not fat. At the end of October I have got the average for some Glasgow milks which were taken in the very same way. The highest was 4·30. That compares the two towns very well.

9180. (*Chairman.*) That was in Glasgow in October, 1894?—Yes, and that was the average of sixty-four samples.

9181. What was the Edinburgh average, did you say?—In Edinburgh it was at that time 3·2. In February, 1900, the average of the Edinburgh milk was 2·84 per cent. of fat, and there was some as low as 2·5 in that lot. That was the average of forty-six samples. I may call to your mind that just about that time we had that very cold weather with the snow.

9182. These cattle are all kept indoors, I understand?—They are all kept indoors.

9183. Are the byres fairly warm?—They are fairly warm, but still the cold weather does seem to affect them.

9184. Are they particular as to the number of cubic feet for each cow in Edinburgh?—They are supposed to be, and I think they are fairly well. Of course, knowing these men have been established a long time I suppose they know the difficulty there would be of making a radical change all at once.

9185. Then in point of fact these byres are fairly warm?—Yes, I admit that.

9186. They would perhaps not come up to what somebody has lately laid down as the regulation amount?—I would not say that they have exactly the regulation allowance.

9187. In the winter and the spring the quality of milk falls?—Yes.

9188. And it rises in summer under this treatment?—Yes, it rises then.

9189. You have examined some other milk later, I believe, than this you have just mentioned to us?—Yes, I have. Those samples were from wholesale dealers direct; they were all a little over 3 per cent.

9190. And the solids not fat, what were they?—The solids not fat were 8·8; that seems to be a fairly fixed amount in Edinburgh for the solids not fat.

9191. According to your experience of Edinburgh milk there might be a difficulty at times in attaining a standard of 3·0 of fat?—I think there might be at some times.

9192. But never in attaining the standard of 8·5 for solids not fat?—I think there would not be any difficulty in the least in that respect.

9193. That is owing to the peculiar manner of feeding?—That is so.

9194. You say that in some cases you have known milk has started on its round in a satisfactory condition as regards the fat, but has been found in the course of the morning to have deteriorated very much?—That is so.

9195. How do you explain that?—I think some of the fat rises and sticks to the side of the tin; when they empty out the tin into the selling pan in the shop some of the fat remains outside the original tin they brought it to the shop in.

9196. That is a question of manipulation, is it not?—It is; but the question is, would any ordinary manipulation overcome it?

9197. With ordinary care would not that be avoided?—My experience is that once the fat is separated from the milk it is very difficult to mix it up again so as to really give a good average sample.

9198. You do not think it is the manner in which the milk is distributed, that is taken off from the top, and so the cream is constantly being removed till the lower layers are weak?—That will account for the fat diminishing during the process of sale.

9199. I understand this was during the process of sale you were referring to?—No, not altogether. The milk is brought in large flagons to the shop, and is emptied into the shop pans; that will account for a certain loss of fat.

9200. It is emptied into them for sale over the counter?—Yes. Then the empty tins go back to the farm or byre carrying with them a small amount of fat, which has reduced the fat from the original milk somewhat. Now the process of sale commences, and if it is not thoroughly stirred up the last customers undoubtedly get a poorer milk than the first customers.

9201. Do you know it is held by the High Court here that the purchaser who comes at the end of the pan has a right to expect as good a milk as the first purchaser?—I know that is so.

9202. Therefore all this is a question of management?—Quite so; it is.

9203. We cannot expect a standard to meet cases where people leave fat hanging about the tin?—I think it is a very difficult matter to mix it up during the process of sale, so that you may get a fair average sample. Several cases, I may say, have been dismissed in Edinburgh by the Sheriff there on those grounds—not where there has been a very great loss of fat, I will admit, but where it has come perhaps to 2·8 or 2·7 or 2·5, or something like that, they have dismissed it on that defence.

9204. Have they a standard in Edinburgh now for fat?—No, there is no standard; they seem to take each case on its merits.

9205. They have nothing to guide them as to what milk should be?—No, they have nothing apparently; there is no standard.

9206. You say in consequence of the manner in which the cows are managed in Edinburgh they want to have a different standard to other parts of the country?—I think they should have a different standard to that for the milk coming from grass-fed cows on rich grazing lands.

9207. Do you think that if the standard were raised to a higher point than you suggest—that is, to 3 per cent.—the question of feeding might overcome the difficulty?—I think it might. But you will never get them to drop brewers' grains altogether. I think wholesale men might raise the standard up to 3 per cent., but it would not reach the shopkeeper at 3 per cent. That is the difficulty, and that is where I think an innocent man might sometimes suffer. Supposing a wholesale man brought it up to 3 or even to 3·1, the chances are that by the time it has got to the shop it will be a little bit below 3, and then unless he mixes it well during the process of selling he will ultimately bring it down from below the 3 and the man might suffer for that.

9208. You also say that you think it would be better to fix a standard which would also quote nitrogen as one of the constituents?—In exceptional cases where you get milk with a very high percentage of fat—I have had them up to 3·7 or over 4 per cent. of fat—you can hardly call that milk an adulterated milk—even when the solids not fat have been down to 8·3.

9209. Still that is a milk to which possibly separated milk might have been added?—I do not think so—not if you take it as Edinburgh milk with a high percentage of fat like that up to nearly 4 per cent.

9210. Where the solids not fat sink what would you suspect?—I should certainly suspect the addition of skim milk or separated milk, but I should estimate the nitrogen.

9211. And that you think would be a safe guide?—I think with that it would be safe. There is the well-known Stockton case, where an appeal was made to the cow afterwards and it still gave the same milk. The solids not fat there were down to 7 point something, but the nitrogen was 0·5.

9212. And that made it safe?—Yes. I think a triple standard in that case should be adopted; I think it would be only fair, because a public analyst cannot help himself now; if the solids not fat are below 8·5 he must report it as having added water.

9213. In your opinion is there much adulteration of milk in Edinburgh?—I can hardly say; it is rather difficult to get at it.

9214. I mean it will come to your notice in a great many cases of prosecutions?—There are a great number of prosecutions mainly for abstracted fat, but a great number of them get off one way or another on the evidence.

9215. And there are very few convictions?—There very few convictions in Edinburgh.

9216. You can tell us something perhaps about the cream trade in Edinburgh?—There are two qualities of cream that have been always sold, and that always are sold. There seems to be a demand for both thick and thin cream. It depends on what they want it for. The thick has from 48 to 50 per cent. of fat; I have never met with any cream with over 50 per cent.; and the thin, which is sold much cheaper, has from 15 to 20 per cent. of fat.

9217. Do you think it would be necessary to lay down a standard for cream?—No, I think you would have a greater difficulty there than you have in the case of milk.

9218. Cream in fact grades itself now, and it is bought and sold according to its quality?—Yes.

9219. Of which a customer can judge very easily for himself?—Quite so. Of course I would not dream of allowing any thickening material to give it a fictitious consistency; the customer might not be able to judge then. But as regards the standard of fat it can be judged by its quality in that way; I think the customer is quite able to judge that without any standard.

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9220. I suppose under the Act now any cream that would be analysed and was found to contain foreign matter would be liable to prosecution at once with or without a standard?—Yes, it would.

9221. (*Professor Thorpe.*) Are you sent here to represent the views of the Edinburgh and District Dairy Keepers' Association?—That is so.

9222. Have you much knowledge of the general character of the milk supply of other cities than Edinburgh?—No, not so much. I have some knowledge of Glasgow. Although I am not official analyst to the Glasgow Dairy Keepers' Association I am *de facto* their analyst.

9223. There is an impression abroad that the general character of the milk supply of Edinburgh is below that of other large cities?—I candidly admit that I think it is.

9224. That no doubt is due to the causes you have mentioned—that the greater number of the cows are fed in the manner that you have described?—I think that is so.

9225. Do you consider that such a character of feeding is a proper mode of feeding a cow?—No, personally I do not think it is.

9226. (*Chairman.*) I suppose you will agree that the effect of any recommendation on the part of this Committee to fix a moderately high standard—not an unreasonably high standard, but a moderately high standard such as would cover the country as a whole—would be in Edinburgh to accelerate that change which apparently the authorities themselves wish to bring about?—I suppose it would ultimately; it would cause a great deal of trouble.

9227. It would cause a little friction to begin with, there is no doubt?—It would; there is no doubt about that.

9228. But it would work in the direction which the municipal authorities themselves desire to bring about?—Yes, I think that is obvious.

9229. And of course with the result that the general character of the milk supply of the city would be enhanced?—I have no doubt it would ultimately.

9230. And possibly the price?—There is no doubt about that—the price would go up. I may say that one or two of the wholesale men admitted that if they could get more for their milk they would stop their feeding on brewers' grains and give better food; but they must charge more for the milk in that case.

9231. Is milk cheaper in Edinburgh than in other towns, do you know?—I think it must be dearer, because you can get milk in Glasgow sent by rail from the south western district at from 6d. to 8d. a gallon. They cannot produce it in Edinburgh under 10d. a gallon.

9232. In Edinburgh they pay high rates?—I suppose that has something to do with it.

9233. And high rents?—Yes, in the city, but then on the other hand you may say the country people supplying Glasgow have high railway rates. I do not know whether one would balance the other or not—I cannot say that.

9234. (*Professor Thorpe.*) The net result appears to be that persons in Edinburgh pay relatively high for a poor quality of milk?—Yes, that is practically what it comes to.

9235. Although this is not *ad rem*, would you say that feeding the cows in that manner with brewers' grains and material of that kind is the proper way to fatten a cow for a butcher?—No, I should not think it was.

9236. So that the interests of Edinburgh both in the matter of butchers' meat and in the matter of milk are not altogether served by this kind of practice?—The animals are not in a poor condition when they are killed; we get very good meat, I think, in Edinburgh. During the last portion of their time, or after they are sold to the butcher, you must remember he will have them for a week or two before he kills them; they will be fattened up then in all probability.

9237. When they get out of the hands of the cowkeeper for dairy purposes they are often treated otherwise?—That is so.

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9238. You have had, I believe, considerable experience as acting for the defence in prosecutions?—I have for the last 15 years.

9239. You have acted for the Association by which you are retained?—Yes, that is so.

9240. In fact, I suppose, I may say that primarily you are retained by this Association for the purposes of defence?—That is what it comes to practically.

9241. Now we have had it in evidence that you have been extremely successful in your capacity as acting for the defence in getting off your clients; is that so?—Yes, I think it is.

9242. The Public Analyst for the City of Edinburgh has said that practically by the fact that you are almost constantly opposed to him, he is unable to get convictions?—Yes, that may be true; I think it is true.

9243. Now, you have just told this Committee of a case of milk in which the amount of fat is as low as 2·3, which you regarded as very doubtful?—Yes. That was one of the series, I think.

9244. Why did you regard 2·3 as an indication of very doubtful quality?—Because it was a mixed milk, and I think 2·3 is too low for an average sample of mixed milk.

9245. But you have had cases before you when you have been willing to condone as low an amount as 2·1?—That was a case from an individual cow. That was admitted by the prosecution to be the milk from one cow.

9246. The milk from one cow?—Yes, I remember that, because the milk was put by for a child on the notion of one cow's milk being best for the feeding of children, and the inspector insisted upon taking it out of that tin.

9247. The milk of this cow was put by for a child?—Yes. You know some mothers like the children to have one cow's milk, and it was put by in one tin, and the inspector went in and insisted upon having the milk from that tin.

9248. Do you think mothers like milk with as low a percentage of fat as 2·1?—I cannot say that, but they have the notion that one cow's milk is better for the child. It is not for me to say whether that is so or not, but that is the notion.

9249. Do you yourself think that milk containing as low as 2·1 per cent. of fat is proper to feed a child with?—No, I do not.

9250. You have no reason, have you, to suppose that there is any considerable addition of separated milk to milk going on in Edinburgh?—No, I have no special reason to know it. I have never been able to get hold of cases where I had any suspicion of that.

9251. Does separated milk find its way into Edinburgh?—No; very little is sold in Edinburgh; I do not think there are more than two dairies that have a separator.

9252. Does separated milk come in by rail?—No; some of it comes, I think, just outside Edinburgh (I do not think it is in the burgh) to an oleo-margarine factory, but it does not come up for sale into Edinburgh itself. You get it in the West of course; it comes into Glasgow, I know.

9253. You have said that occasionally milk vendors get off for the reason that you have stated, namely, that the Sheriffs are willing to believe that a certain quantity of the fat has accidentally disappeared by the manipulation, or in the pouring from vessel to vessel, or what not, which the milk has undergone?—Yes, I think some of the cases have turned on that.

9254. Would your Sheriffs have regard to a decision of the High Court here?—I suppose they do to a certain extent.

9255. If then they had brought to their knowledge this particular case that his Lordship has referred to, would they not have regard to that?—I should think they would, it never has been brought up.

9256. That never has been brought up?—Never; not in any case that I have been connected with. No decision of that sort has ever been mentioned.

9257. (*Major Craigie.*) You are representing, I think you told Professor Thorpe, the Edinburgh Dairykeepers' Association; is that a very large body in numbers?—Yes, but I really could not tell you the number of members that belong to it. Nearly all the dairykeepers belong to it.

9258. You refer in your *précis* to the 450 dairies within the town?—Yes.

9259. What proportion of those are represented on the Society?—I should say at least two-thirds. The dairy shopkeepers in Edinburgh are a constantly changing body. It seems to be a sort of trade they will go into for a little; they think it is a trade to make money in, and then they find it is not the best, and out they go, and take to something else.

9260. Is it the fact that a number of the dairy men who keep a number of those small shops also do other business?—Yes, in Edinburgh they do.

9261. So that in Edinburgh there is the practice of connecting dairying with other trades?—Yes. The municipal people have tried to stop it, and they have stopped it to some extent, because some of the dairies were selling very objectionable things.

9262. The Association that have sent you up here have discussed this subject on several occasions, I believe?—Yes.

9263 And a good deal of publicity has been given to their deliberations?—Yes, I think in the "North British Agriculturist."

9264. I was just going to call your attention to the report of a meeting, in which I find it is stated that the Association voted by a majority of two to one that the standard of fat should only be 2·55?—That is so; and I refused to give evidence on a standard of that kind.

9265. So that the understanding that was finally come to was that you were to represent to us that a higher standard, namely, 2·75, would be accepted, and the ground on which they agreed to that was that it was not desirable to represent that the milk in Edinburgh was inferior to the milk produced here—that seems to be the argument?—I did not know; I was not at that last meeting. I simply wrote and said I could not give evidence on the 2·55 standard; I was not at that meeting, so I do not know what the grounds were. I have no doubt the report is correct.

9266. The object of the Edinburgh Dairykeepers' Association is to keep the standard as low as possible?—I would not say that.

9267. I am merely judging from the report of the speakers?—The report may be all right, but I think there is some mistake.

9268. You were not present?—No, I was not present, so I could not say.

9269. You would not say that it is the desire of this particular Association to keep the standard as low as possible?—No. I may say that at the meeting that I was at the feeling of a few of them was to keep it as high as possible, because they said it was the wholesale man whose duty it was to keep to the standard, and if it not the wholesale man should suffer.

9270. The views in favour of a low standard, although apparently held by the majority, were very strongly opposed by the minority who were in favour of a higher standard?—Yes.

9271. And they pressed that point?—Yes.

9272. And that was the conclusion arrived at after the difficulties of prosecution in Edinburgh had been shown?—Yes, I think it was.

9273. In the discussions that took place at that Society and in others in Edinburgh, has this question of the use of separated milk been alluded to?—No.

9274. It has not?—No, it has never come up; there is practically no separated milk sold in Edinburgh.

9275. Not as separated milk?—I do not think it is sold at all.

9276. Not for mixture?—No; there have been a number of samples of skimmed milk taken in Edinburgh by inspectors, and there has been no prosecution in the matter. All the samples I have had as skim milk I believe are skim milk. They have all had over 1 per cent. of fat, anyhow.

9277. The impression that you have got from the very low quality of some of the milk you have seen is mainly due to the quality of the feeding—the stuff that is used to feed the animals produces great quantity but low quality?—That is so.

9278. And it is so low in quality that it does not require in Edinburgh to be mixed with separated milk?—You are asking me to make too great an admission.

9279. You will not make that?—No.

9280. (*Mr. Barham.*) When you speak of wholesale men, do you mean the producers?—Yes, that is so.

9281. (*Major Craigie.*) Have you heard of discussions by other associations in Edinburgh, either dairy or others, on this subject?—No; there is no other Dairy Association in Edinburgh. I think some of them met with the Chamber of Agriculture, but I could not go to that meeting as I was out of town.

9282. You were not present at that meeting?—No, I was not.

9283. There was another meeting?—Now that you have mentioned it, there was a meeting with the Chamber of Agriculture.

9284. Is there an association called the Edinburgh and Leith Association?—There is the Edinburgh and District Dairy Keepers' Association.

9285. Is that different from the one you represent here?—No, I represent the Edinburgh and District Dairy Keepers' Association.

9286. Is there not another association?—There is a Leith one.

9287. Only Leith?—Only Leith, I believe. I know nothing about that one.

9288. I think the Committee has had communications from another association?—The wholesale men form an association of their own, and they call it the Dairymen's Association, I think.

9289. That is what I want to get at?—I beg your pardon. There is another one at Edinburgh—the Dairymen's Association. It is a very small association, I think. It is altogether confined to the wholesale men or the producers.

9290. And your association, in contradistinction to that, represents the retail trade?—Yes.

9291. The direct dealing with the consumer?—Yes, that is so.

9292. (*Dr. Voelcker.*) Is it the fact that it is the custom to milk the cows three times a day?—Yes, it is; at 4 o'clock, 10 o'clock, and 5 o'clock.

9293. Has that much influence on the quality of the milk?—I think it has. The milk taken after the longer interval is poorer than the milk taken after the shorter interval. I think that is a pretty generally acknowledged fact.

9294. Is it the custom on farms to habitually remove a portion of the cream of the evening milk and to mix partly separated milk—partly skimmed milk—with the morning milk?—I cannot say that. I do not know that.

9295. Have you heard of such a practice?—I have heard it being suggested as being done, but I could not really speak on the point at all.

9296. You have no knowledge of it yourself?—I have no knowledge of it at all. It is very rarely I am in the byre at all. The sample is simply sent in to me. I have no experience of that.

9297. You have told us there are not many separators used?—That is so, as far as I know.

9298. Is the milk much hand skimmed?—Yes; practically all the cream that is sold in Edinburgh is hand-skimmed cream. I think there are two dairy keepers who have separators.

9299. What do you suppose becomes of the milk from which the cream has been separated?—I think it is sold as skimmed milk for cooking purposes.

9300. Is it sold as hand-skimmed milk or as separated milk?—Just as skimmed milk. The term "separated milk" is very little used in Edinburgh.

9301. You only hear of skimmed milk?—We only hear of skimmed milk.

9302. Do you know whether any quantity of this skimmed milk, meaning hand-skimmed milk, or separated milk, meaning machine-separated milk, goes to biscuit manufacturers in Edinburgh?—It may; there are several biscuit makers there.

9303. Do you know whether they take separated milk or whole milk?—I really could not say that.

9304. You rather suggest that Edinburgh should be placed on a different footing to other towns and other districts in Great Britain?—Yes, that is so.

9305. Why should the people of Edinburgh be any differently served to the people of other places?—It is difficult to suddenly alter the feeding.

9306. Simply because a certain system is in vogue?—Exactly. There is a large amount of capital involved in the business. It seems to me a very difficult thing to overthrow the whole thing all at once.

9307. Is it the general experience that stall-fed cows give a worse quality of milk than those that are out in the country?—No; if you stall feed cows with cake and the highly nitrogenous food you get better milk. Stall-fed cows, as a rule, it is laid down in the books, give better milk, but I do not think that the stall feeding of the books means brewers' grains and potatoes, which is all they get in Edinburgh.

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9308. Do you attribute the poorer quality of the milk supplied in Edinburgh to the fact that brewers' grains are very largely used?—I do.

9309. Will they give a larger quantity of milk though they reduce the quality?—Yes, that is so.

9310. But you are aware that you may counteract the influence of succulent food like brewers' grains by giving bean meal or cake to make up for it?—Yes; but then you add so much to the cost of feeding that I doubt whether they could sell the milk even at 10d. a gallon.

9311. Why should the milk supplies of Edinburgh be under different conditions to those of the rest of the country?—You have got in other parts of the country rich grazing grounds which we have not got near us. You can get better milk in London, for example, than you can almost anywhere—that is because you can draw from the country.

9312. Is it your experience, or have you any experience on that point, that the difference of grazing land makes so much difference in the quality of the milk?—Yes.

9313. On the quantity?—I cannot say about the quantity. The milk that is sent to me from the West of Scotland and the South-West of Scotland is very much richer than Edinburgh milk.

9314. You do not know whether in the one case the samples sent are check ones and the other not?—That is rather a difficult thing for me to get hold of.

9315. You could not say?—I could not swear, but they are not sent as official samples as, for example, in the case of a prosecution. They are sent simply to ascertain the quality of the milk. So I should look upon them in that case certainly as genuine samples.

9316. Do you see any reason why, because one man milks his cow three times a day and another milks his cow only twice, there should be different standards fixed?—Yes, I do to a certain extent. When you have got an enormous amount of capital involved like that, to go and lay down something that will upset the whole thing seems to me to be rather hard.

9317. You look at it purely from the financial point of view—the cost associated with altering the system?—That is so.

9318. Would you say that the authorities are really wishful for a change in the direction of getting a better quality of milk for Edinburgh?—I am not in the authorities' confidence, and I could not say directly. I know they are trying, and have been trying, to improve the condition of the byres and that sort of thing; so I have no doubt, as a good municipal authority, they would like to have the milk as good as could be produced.

9319. But that may be simply with a view to the sanitary surroundings?—In the meantime it certainly is.

9320. They have not shown, if I may so put it, any particular disposition to favour the sale of milk of high quality?—No.

9321. There has been, I think I may say, rather a tendency to allow milk of poor quality to pass?—I could not say that exactly. I do not quite see how you can get at it in a way. The public authorities prosecute in those cases where milk is of a poor quality and in nearly all the cases of water they have gained their point, and the person has been convicted. There have been a number of convictions for watering the milk in Edinburgh.

9322. That is not the evidence we have had already before us; the evidence we have had before us so far is that it is a most difficult thing to get a prosecution carried to an end. I gathered that from Mr. King's evidence?—I think perhaps you have taken him up wrong there. I think he meant as regards abstraction of fat. I am sure I have had within the last two years nearly 20 cases of watered milk which I have not defended at all and would not defend; and they have either pleaded guilty or just taken their own defence in the matter. I am speaking now from recollection, but I should say I have had about 20 cases. In the cases of the abstraction of fat I am ready to admit I have won the cases—I will put it that way.

9323. Whether it be an addition of water or abstrac-

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tion of fat it practically comes to the same thing—it is adulteration?—Yes, and there are cases that have been won by the town authorities.

9324. You would regard the fat as the most valuable constituent in the milk from a dietetic point of view, would you not?—Yes, of sweet milk, certainly.

9325. In whole milk?—In whole milk.

9326. So that, as far as the public is concerned, whether water has been added and the percentage of fat reduced in that way, or whether cream has been take off, or whether separated milk has been added similarly to reduce the amount of fat, it comes to practically the same?—As far as it is adulteration, yes.

9327. Confining yourself to the cases which you have mentioned, those of fat abstraction, would you not admit that there has been a general disposition on the part of the authorities to condone cases of fat abstraction?—I do not think so. They have prosecuted. What more can they do?

9328. Is it not a fact that the public analyst of Edinburgh has brought up case after case and prosecutions have failed?—A certain number of cases certainly have been brought up and the prosecutions have failed; I should not like to put it down as case after case.

9329. When he tells us that the working of the Act is practically, as regards milk, a dead letter in Edinburgh, has he exaggerated the case or not?—I really could not say on that point.

9330. Have you any record to show the number of successful prosecutions that there have been?—No, I have not, but there certainly are some.

9331. Has there been any case which you have defended on behalf of your association where a prosecution has been successfully carried through?—There may be one or two, but I think the majority I have won.

9332. Can you call to mind any that you have not successfully defended?—I cannot call to mind a special case, but I have no doubt I have lost one or two.

9333. You may have lost one or two?—I may have lost one or two.

9334. But they form a very small percentage?—Yes, that is so I must admit.

9335. You are generally successful?—I should not take up a case unless I saw some chance of success; I should simply drop it.

9336. Then I will ask you on the points which led you to take up those cases. Do you agree that adulteration is pretty rife in Edinburgh?—No.

9337. Not as regards fat abstraction?—No, I do not think so.

9338. Cases are brought up and fail?—Yes, but I do not say the milk is adulterated. I say it is genuine milk of poor quality.

9339. It was your opinion in those cases that milk was not adulterated?—That is so.

9340. Is this outcome based upon your taking a different standard to the public analyst?—No, I do not think so. The public analyst has altered his standard once or twice. I really do not know what his standard is; it has been 3, and it has been 2·75.

9341. But whether he takes it as 3 or 2·75 your standard is what?—My standard is 2·75, and has been all along.

9342. Where your analyses are brought in conflict with his there has been, I understand, a practical agreement in regard to the analytical figures?—Yes, I believe so.

9343. The difference has been in the opinion based upon those figures?—Yes, that is so.

9344. Would you say that the cause of the divergence of opinion which has led the sheriffs eventually to dismiss such cases has been the difference of standards adopted by the analysts concerned, inasmuch as the public analyst takes, or is supposed to take, 3 per cent. of fat and you yourself take 2·75?—To some extent I have no doubt, but in one or two cases there has been an appeal to the cow during the interim of the case, or to the herd as the case may be—sometimes it is a small herd—and I have been able to show that the milk was genuine milk.

9345. But you would not say that the result has been based upon the small difference between taking these two standards?—Not entirely.

9346. Have the magistrates no knowledge of the standards that are adopted through the country?—These cases very seldom come before the magistrates, they are brought before the sheriff. Both sides prefer the sheriff to hear them rather than the magistrates.

9347. Do the sheriffs not know anything about the standards?—Yes, they do.

9348. We have been told that they do not go upon the standards, but that they go upon the opinion of the analyst?—I think they take a very broad common-sense view of the case on its merits more than any standard. You see there has been no standard really laid down by law; they could not go by any legal standard when there was not such a thing.

9349. You yourself are aware of the standard of the Society of Public Analysts?—Yes, quite so, 3 per cent.

9350. You yourself are aware of the standard adopted in the Government laboratory?—Yes; it was 2·75, now it has been raised to 3.

9351. Have you any disagreement with either of those?—I think 3 is a bit too high. I think 2·75 allows for all contingencies.

9352. Including the special ones that are in existence in Edinburgh?—Yes. I think it would be possible for the cow keeper, by altering his feeding, by increasing the richness of his feeding, to produce a milk which would always pass that 2·75 standard without any injury or hurt to anyone.

9353. But the sheriffs, you tell us, do not take into great account these standards?—No, I do not think they do.

9354. They depend on the opinions expressed by the analysts?—Yes.

9355. Then if one analyst comes into court and says a milk is adulterated, and another one says he cannot certify that it is adulterated the result is the case is not proven?—Generally yes.

9356. And generally you are the person who is willing to come into court and say that you cannot certify that there is adulteration?—I am not the only one; there are others too.

9357. What others?—Some other analysts in Edinburgh.

9358. Will you tell me some?—Dr. Macadam—he has been with me on one or two occasions when there has been a dispute—Mr. Ivison Macadam (that is his son)—I really could not say whether Professor Aitken has come into court in a case or not; but there are two.

9359. The general result of your appearing to say that you cannot state that the milk has been adulterated is that the case is dismissed?—I do not think you should put it all on my shoulders that the case has been dismissed. There is other evidence besides the scientific evidence.

9360. Is it not the case that the Public Analyst of Edinburgh constantly brings cases into court, and upon certain figures he says that in his opinion the milk is adulterated; you while appearing on behalf the Dairymen's Association do not disagree at all with his figures, but you disagree with the conclusion he has come to?—Yes, but you must remember that is not the only evidence led for the defence. There is other evidence led—not evidence of opinion but evidence of fact is led by other witnesses very often. The Sheriff will form his opinion on that as much as on the scientific evidence. If the scientific evidence from the two parties is absolutely at variance the Sheriff must base his opinion on some other facts brought out in the case besides the mere scientific evidence.

9361. I will not deal with the ultimate conclusion come to in the case; I will deal simply with the analytical figures which are before the Bench. The Public Analyst, taking a standard which is not materially different from the one which you adopt, comes to the conclusion that a milk is adulterated; you do not disagree with his figures, but you are willing to certify to the effect that you cannot say it is adulterated?—Yes, that may be so.

9362. And you told me that that difference of opinion is not based upon any difference of standards between you two as analysts?—It may be. I should have to go into each individual case to answer that question. For example, Mr. King, if he gets 2·75, would return the milk as adulterated with nearly 20 per cent. of cream abstracted.

9363. It is not a question of percentage; it is a question of whether the milk is such as should be sold, such as the public have a right to expect?—I think if they get a milk with 2·75 per cent. of fat it is as good as should be sold.

9364. There are cases where you have certified a milk as giving only 2 per cent. of fat and where you have stated that you cannot say that it is adulterated?—Yes. I have never been asked the question "Is that milk of the quality that should have been sold"?—I have simply been asked "Is it adulterated, or is it not?"

9365. You told the Committee just now that in your opinion milk of that quality ought not to be called milk?—Yes.

9366. And that you could not come here on behalf of the Dairymen's Association to support a standard as low as 2·55, which they suggested?—That is quite true.

9367. And you could not support anything lower than 2·75?—Quite so.

9368. Now, I say if those are your views, that 2·75 is the lowest standard that could be adopted, on what grounds do you meet the Public Analyst of Edinburgh, who takes a standard of 2·75 in cases of prosecution, and then tell the magistrates or the Sheriffs that you cannot say the milk is adulterated?—If the Public Analyst through the counsel or lawyer connected with the case, asked me the same question you have asked me I should have given the same answer; I do not think it is of the quality that should be sold as milk. That question has never been given to me in court. I have been simply asked the question, "Is it in your opinion adulterated; has cream been extracted?" I never answer a question in court that I am not asked; it is a very dangerous thing to volunteer information in court.

9369. That is taking a legal technical point?—Yes; it is from the legal technical point, I am in the court, remember.

9370. Do you think it is part of the functions of an analytical chemist when he meets a brother professional man in court, and an opinion has to be given on certain figures which are before the court, that he should assume a legal position, and take other matters into consideration besides those?—That is a question for discussion, but I think I am only doing what is right in taking up that position in the case. Mr. King would do the same thing with me in other cases.

9371. Do you think you are doing the right thing as regards the supply of milk to the Edinburgh public?—I do not see that I am doing anything wrong as regards the supply of milk to the Edinburgh public.

9372. Does that action tend to the giving to the public of Edinburgh a better supply of milk, a milk of a quality which you yourself tell us it ought to be?—It is not for me to see after that.

9373. But it is for you to see to the interests of your Dairy Association?—I think so.

9374. And try as far as possible to get any sample of milk which they are brought to book about passed on the ground that you cannot say it is adulterated?—If I think it is not adulterated, certainly that is my duty. If I do think it is adulterated I refuse to have anything to do with the case.

9375. You told us you do not base your statement as to the milk not being adulterated, upon the figures, which are practically the same analytical figures as those of the Public Analyst; what do you base it on, then?—In the first place we have different standards. He takes 3 per cent., and I take 2·75; that makes a difference of ·25 per cent. of fat, you see.

9376. He only reports in prosecutions when he takes a low standard, and he has told us that he takes it at 2·75?—Mr. King has forgotten there, I think. I think I can turn up some cases where he has taken it on the 3 per cent.

9377. When you are dealing with the milk of 2 per cent. of fat surely the standard disappears altogether?—No. I explained that was the milk of one cow.

9378. Is that a unique instance?—Yes, I think so.

9379. Have there not been many cases of 2 per cent., or slightly over?—No, I do not think so.

9380. I will put it, considerably below 2·75: have there not been many cases where the Public Analyst has stated that in his opinion the milk is adulterated, and you have said that you cannot certify that it is?—I do not think so; not below 2·75.

9381. I will put it to you?—I do not think so; there may be; I am not prepared to deny it.

9382. Has not your statement that you cannot say the milk has been adulterated been based rather upon the fact that you could not certify that you had seen it mixed?—No.

9383. Or that there was no one else who had seen it mixed?—No; nothing of the kind.

9384. Rather than upon the actual figures?—No.

9385. Then it comes to this; if your analyses agree, the whole disagreement must be in the different standards that you take?—To a great extent it is.

9386. You have told us just now that was not the case?—I do not think so; I did not understand you. How was the question put before me, may I ask?

9387. I certainly understood you to say that the dismissal of the cases did not rest upon the small difference?—I say on other evidence—not on mine, necessarily.

9388. Then I put it to you that the causes of the cases being dismissed are that you certify that you cannot state that there has been adulteration, because you and other people whom you have enquired of have not seen anything?—Not that I have enquired about—that have come forward themselves. I know nothing about what their evidence is before I go into court.

9389. You state that you cannot certify to its being adulterated, because you yourself have not seen the adulteration go on?—I do not go on that ground altogether.

9390. Would you maintain that when you have told the Bench that you cannot state that adulteration has taken place their judgment has been formed partly on the analytical figures of your analysis?—I could not say on what ground the judgment has been formed. It is certainly impossible for me to say that. I do not know the mind of the Sheriff or the magistrate.

9391. Your analysis has not been your sole guide?—It depends on the case very much. I could not say. It depends entirely on the case. My analysis is a guide to a certain point. Then I have the results of other men, abnormal milks, and things of that sort.

9392. You have looked not merely to the results of that particular analysis?—I could not say that in a general way. I must know the particular case.

9393. Have you then reported upon such a low sample of milk as if it came to you without any previous knowledge of it, or was going to be dealt with by you without any subsequent knowledge?—Take that 2·1 that you mentioned. I remember the circumstances of that. It has been quoted very often since. That case I reported as adulterated by the abstraction of fat, and then the lawyer employed by the man came to me and told me the case was that of one-cow milk. I went and saw the Public Prosecutor, and he admitted, and the Sanitary Inspector admitted, that it was a one-cow's milk. That was the defence set up. Every case must stand upon its own merits. I could not speak generally as to the line of defence in any one case.

9394. Did you give a certificate to say that that milk was adulterated?—At the beginning I did. My words would be substantially like this: "Judged by the ordinary standards I consider this milk to be deficient in fat so much."

9395. Did that certificate go before the Bench?—Oh, dear no.

9396. Was it withdrawn in favour of something else?—No, it was never withdrawn. The Bench had nothing to do with it. It is not like when you are acting for the prosecution, where every document goes in.

9397. The public analyst reported that the sample was adulterated?—Yes, and I did the same.

9398. That case was dismissed, was it not?—I think so, because, as I say, it was proved and admitted by the sanitary inspector who took the milk and knew the farm well that it was one-cow's milk.

9399. Was any certificate or evidence of yours brought into that case which helped to secure the dismissal?—I have no doubt some figures I brought forward showing what the limit of one cow's milk had been—some in Dr. Bell's book, some by "The Analyst," Dr. Vieth, and Mr. Richmond—all helped it.

9400. The first report was to the effect that the milk was adulterated?—Yes, judged by the ordinary standards.

9401. How was it that that did not go in support of the public analyst, but was withdrawn in favour of something else?—It was never withdrawn. The lawyer does not bring it forward.

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9402. The lawyer did not bring it forward?—No.

9403. Did the lawyer get you to bring forward some other evidence bearing in the other direction?—When I found out what it was I looked up the various cases there have been about one-cow's milk and that sort of thing, and I gave him all the figures and they were brought forward.

9404. You found there would be quite sufficient material in these abnormal cases to enable you to be an efficient advocate in favour of the poor quality milk, and so you represented the case. That is practically the outcome?—No, it is a case of justice. You must remember there has been no standard up to the present.

9405. A case of justice. Whom to—the public?—To both, I should say.

9406. To the public analyst?—Certainly; he carries out his duty.

9407. Was the public analyst wrong in certifying that that milk was adulterated?—No, certainly not, judged by the ordinary standards.

9408. And yet you give your evidence against him?—The public analyst admitted in the box, in cross-examination, that one cow's milk might sink to that.

9409. Every chemist would admit that, would he not?—And yet it might be genuine milk. It was not a question where the man was prosecuted on standards at all. The question before the Court was, is this genuine milk or is it not—that is to say, is it milk that comes from the cow or is it milk the fat of which has been artificially extracted from it.

9410. And you went into Court stating that this was milk——?—As it came from the cow, or it might be. That is my statement. I would not be so positive. I submit it as a milk that might come from one cow——

9411. Nobody would doubt that for a moment?—No.

9412. But is that milk that ought to be sold?—That is another question. I was not asked that question at all. How is the cow feeder to know whether it should be sold or not? How could he tell the quality?

9413. You oppose the public analyst and those people who are trying to get a good milk supply, and now you come before this Committe and tell us this should not be called milk?—Yes, I do.

9414. Do you consider those things are consistent?—Yes, I do. There is a new state of matters coming in now. You are going to have a standard, and it is quite fair that the milk should be up to a certain standard. There has been no standard hitherto. It is a question before the Court whether it was genuine milk as it came from the cow or milk which had been artificially treated by abstraction, and no question of standard cropped up.

9415. (*Mr. Cowan.*) I think you state that about one-third of the milk going into Edinburgh is from the country?—Yes, that is so within 10 miles distance—more than four and less than ten.

9416. Does the milk from the country go principally into the hands of the retailers, or does it go into the hands of the wholesale men?—I think chiefly it goes to the retailers.

9417. Is it your experience that the milk from the country is a better quality than that from the town dairies?—Yes, it is.

9418. Do you attribute the rather poor milk in the town dairies to the feeding of the cows with brewers' grains?—Yes, I think so to a great extent.

9419. Does your milk reach Edinburgh from a distance by rail?—I think there is one association which has just been started, the Cash Milk Supply Association, which gets it in by rail. But that is the only one that I know of.

9420. The Edinburgh public, I think, prefer warm milk rather than cold milk?—Yes, I think they do.

9421. And, of course, it would be all cold milk coming by train?—Yes, of course.

9422. Do you think the fixing of a fair standard would prevent the Edinburgh dairy keepers from raising the standard of the milk by feeding?—I do not quite follow your question.

9423. If a fair standard is fixed, do you think there would be any difficulty in the town dairymen reaching a fair standard?—No, I do not think there would. I think if you keep it about 2·75 it would be always safe to that extent.

9424. Would there be any difficulty in getting it up to 3 per cent.?—I think there would. You might get it up to 3, as I said, by the wholesale feeders, but how much are you going to allow for the loss in carriage between the byre and the dairy?

9425. A penny per gallon?—I mean loss of fat. There is always bound to be a certain amount of loss of fat between the byre and the shop if it is carried any distance, or if it stands.

9426. Is there a tendency in Edinburgh to reduce the town dairies?—I do not suppose they mean it directly, but indirectly there is, I think, because they are laying restrictions now as to what the dairy shall sell, and things of that sort, and that has driven a lot of smaller people out of the trade no doubt.

9427. In the course of time there will be fewer town dairies?—I suppose there will be.

9428. I suppose there are in Edinburgh more than in any of the other large towns?—I was under that impression, but I was told the other day that Birmingham had a very large number. I cannot speak positively. It always struck me that Edinburgh had the largest number of town dairies of that kind.

9429. You have found a considerable difference between the morning milking and the afternoon?—I have.

9430. Would there be any difficulty in regulating the milking of the cows to supply Edinburgh at regular periods?—I think there would be to some extent. If it is coming in by cart, and not by rail, you must have your first milking about four o'clock in the morning; they might do away with the ten o'clock milking, perhaps, without much difficulty, and just milk twice a day; but I think you would have some difficulties, as there is not a large field to draw upon.

9431. Would there be much difficulty in having the two milks mixed, the morning and the afternoon milk?—I think there would there, especially in hot weather with the working of the cart, and that sort of thing.

9432. I see you speak of the average quality of the milk from the rich grazing grounds as being bound to be higher than where the cows are house-fed?—That is my opinion—house-fed on the Edinburgh system, of course, I mean, with brewers' grains.

9433. You are aware that cows in the most part of Scotland are getting house feeding for at least six months of the year?—Yes, I know, but that is on a regular farm where the farmer can use the manure. He can afford to use richer nitrogenous food there, because he gets the manure. The ordinary dairyman in Edinburgh cannot get rid of the manure, and it is no advantage to him to produce a rich manure.

9434. But you would allow that the milk which is sold from the country dairy farms, say, in the south-west of Scotland, is richer in the winter than during the summer months?—Yes, I have said so.

9435. Do you not think the Edinburgh people would prefer to get a richer milk if they had the opportunity of buying it?—They would if they could get it. The south-west supplies Glasgow, it supplies Dundee, and it supplies a certain number of other towns; I do not know whether it could supply Edinburgh.

9436. We could supply it if we could get the price for it; from what part have you got samples of those?—From Ayrshire, and I think I have had one or two from Wigtownshire, Renfrewshire, and down there.

9437. Have you had samples from creameries in Wigtownshire?—No.

9438. They have come from the producers?—From individual producers.

9439. (*Mr. Barham.*) You say milk is sold warm in Edinburgh?—Yes.

9440. That applies of course to both the morning and the afternoon supply?—Yes.

9441. And that would be the reason for the early milking time in the afternoon?—Yes; the shops are practically sold out about 12 o'clock.

9442. If warm milk is sent a distance of 10 miles, or even of six miles—it is driven in a cart, and the vessel that contains it is not always quite full: Would not a good deal of the cream be churned up into globules of butter fat?—I do not think so; they come in in spring carts, and I should not think there would be as much jerking as that.

9443. You have not noticed it?—I have not. It would depend very much on the temperature. I cannot say I have ever noticed it.

9444. If it is not cooled you see the temperature would be nearly 90, and if the day was a warm one, with the sun and so on in the summer time, what would you say then?—I cannot say—I have never noticed that.

9445. You have not found butter globules?—No.

9446. You state very clearly that there is a loss of butter fat between the time of the production and the time of the actual sale to the consumer?—Yes. It might occur to some extent in that way; that might account for it; but I have always put it down to the sticking round the side of the churn.

9447. You took some samples in July, 1894?—Yes.

9448. And you say there was an average of butter fat, I think, of 3·2?—Yes.

9449. Were they samples of the whole day's milking of the three different meals?—No, they were all morning's milk.

9450. They would be all morning's milk?—Yes, every one of them.

9451. With reference to this society that you refer to representing 450 dairymen of Edinburgh—have you any reason to believe that they are not fairly representative of honest dairymen of Edinburgh, as well as of those who may be dishonest?—Yes, I think so—I think they fairly represent the honest dairymen.

9452. You have no reason to believe that it is an association of dishonest men?—Oh, dear, no; nothing of the kind.

9453. Who retain you for the purpose of defeating justice?—No, certainly not.

9454. I take it if you supposed——?—I would have nothing to do with it. I have refused on several occasions to defend cases where I knew there was adulteration, or felt convinced in my own mind that there was adulteration.

9455. I think it is quite true what you said with regard to Dr. King when he gave his evidence. I do not remember his stating in any one case that you disputed his figures or the conclusions that he drew from them in a case of milk adulterated with water?—That is so. I do not think I have ever done so.

9456. It is only right to tell you that; so far as I understood his evidence it was entirely on the question of butter-fat?—That is so.

9457. The dairy keepers asked you to support a standard or a minimum of 2·55?—Yes, that is so, at one time.

9458. I think it was reported in the "North British Agriculturist" that the average of the samples obtained in February was 2·64, but that is a mistake, is it not?—No, it was not at that time. There were fifty samples to be taken, and I think there were only twenty-seven, or something like that, taken at that time; and they were taken during the very cold weather. The average was 2·64, I think, but as the other samples came in they brought the average up.

9459. And it was at the meeting that followed when the average was 2·64, at which they decided or suggested that the limit should be 2·55?—Yes, I think that was the case.

9460. Then, afterwards, more samples were taken, and that brought your average up to 2·84?—Yes.

9461. But in either case you thought the 2·55 was too low?—I did; it was milk produced under exceptional conditions, and there were one or two very low milks in that. I thought the standard was too low for general average.

9462-3. When you ultimately found an average of 2·84, of course, in order to get that average, many of the samples must have been below it, and, of course, there were many above it. Therefore, in order to get anything like a safe limit for milk produced in Edinburgh, you thought you could not possibly go higher than 2·75?—That is so.

9464. (*Chairman.*) Are those samples samples of herds or individual cows?—Of herds, certainly.

9465. (*Mr. Barham.*) You say that you have no doubt that by altering the feeding the producer could increase the fat in the milk somewhat, but never to the extent that would ensure the retailer selling milk all the year round and under all conditions with an average of 3 per cent.?—That is my opinion.

9466. A standard of 2·75, you think, would meet that?—Yes, I think it would meet that.

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9467. I think you point out that the samples in Edinburgh are invariably or usually obtained on a portion of the morning's milking?—It is the morning's milk; I have never had a prosecution case on a sample taken in the afternoon.

9468. I take it that the inspector in the performance of his duty very naturally tries to find the milk when he is most likely to obtain it impure?—There is a larger sale of milk in the morning than at any other time. I suppose that is the reason of it.

9469. Now, we have heard that on several occasions an appeal to the cow has been actually made?—Yes.

9470. Speaking here from a chemical point of view, and also from the legal point of view, as Dr. Voelcker has pointed out—looking at it from a legal point of view, you have read the previous Act, or the present Act, that has recently become law, to mean that so long as a producer or a dairyman supplies the genuine product of the cow to the consumer, that is all that he is called upon to do by law?—That is so; that is my opinion.

9471. That no standard has hitherto been set down except the standard of pure unadulterated milk?—Quite so.

9472. And that under the new Act, even if we do lay a standard down, we only raise a presumption that that milk is adulterated, and, I take it, any producer or dairyman can come forward, and if he can prove that it is the actual produce of the cow, fair whole milk, even then there would be no standard to guide the magistrate, and the magistrate will decide upon the merits of the respective cases?—I did not look at it in that light myself. I am not a lawyer, of course. I thought the new Act got rid of all that difficulty, and said unless this milk contains so much butter fat and so much solids not fat, it shall not be considered milk, no matter what evidence is brought forward. That is my reading of the Act, but I may be wrong there.

9473. As Major Craigie will tell us, it will raise a presumption?—I must confess I have not read the Act carefully through yet.

9474. Even now Parliament intends only to punish those who sell adulterated milk, and not the genuine milk of the cow?—It is not for me to argue the point, but it seems to me that one point upsets the other.

9475. (*Mr. Farmer.*) You tell us that on two occasions in five years you have analysed a series of samples from dairies?—Yes.

9476. What do you mean by dairies there?—Retail dairies.

9477. Are those samples that you have analysed really as taken from herds of cows?—Yes, it is the mixed milk in the dairies.

9478. But not taken absolutely in the byres?—No.

9479. So that the samples are taken really from the dairies and the shops?—Yes.

9480. You speak of brewers' grains; would it be brewers' grains or distillers' grains?—It would be brewers' grains. There is very little distillers' grains, on what we call distillers' dregs, used up there.

9481. (*Chairman.*) Following on what Mr. Barham said, you do not apparently quite know the wording of the section which lies before us?—No. I had not looked at it in that light before, I must confess.

9482. What we are asked to do is to recommend whether the Board of Agriculture should or should not lay down a standard, and if milk falls below that standard, it is to raise a presumption that that milk is not genuine, unless the contrary is proved; apparently in Edinburgh you have had no difficulty when samples are being taken, and have been proved to be of a low quality in getting an appeal to the cow immediately?—No, we have had no difficulty. There have not been very many cases where an appeal to the cow has been made, I daresay.

9483. Would that rather alter your opinion, supposing there was such a standard fixed as 3 per cent. with this appeal to the cow, the standard merely raising a presumption, and the owner of the milk being able to appeal to the cow; do you not think a standard a little higher than you suggested might be introduced, and yet be safe under these circumstances?—Of course, you will be increasing the machinery of the Act up there to some extent. Every prosecution would cause more trouble and cost more expense, and you must remember the milkmen have to stand the expense. We never get expenses in Edinburgh; in fact, I do not think you get

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them anywhere under the Act; a milkman has to stand all the expense of that.

9484. Does he not get his costs now if the prosecution fails?—If the prosecution fails he gets nothing; he has to pay his own expenses.

9485. At all events, barring the question of expense, there would be no difficulty in Edinburgh?—As far as I am aware I do not think there would be any difficulty.

9486. (*Major Craigie.*) Arising out of what Mr. Farmer said, I find there was more than one meeting in Edinburgh on the occasion I referred to before, and that at the first of these meetings you were present?—At the first one I was present, that is when the 2·55 standard was adopted.

9487. And at that meeting a report from you was read?—Yes.

9488. On the 27 samples that we have discussed?—Yes, I think it was 27.

9489. You added that the high percentages of butter fat—4 per cent. and the like—which were guaranteed by dairy companies in the South of England were not possible in Edinburgh, because in the south of England the cows had some of the richest pasture in the country, whereas in Edinburgh brewers' grains and distillery dreg were very largely used for feeding, and that kind of feeding tended to increase the quantity at the expense of quality?—I think there is a little bit of a mistake there.

9490. I understood that in reply to Mr. Farmer you said the distillery dreg is not used there?—It is not very much used. I think there is some mistake in that report. I do not think I used the term "distillery dreg" there.

9491. Distillery dreg is in this report?—Which report?

9492. The "North British Agriculturist" of the 28th February?—I do not think I used the term "distillery dreg"; I think that has crept into the discussion, or something of that sort. There is not much distillery dreg used. I will tell you what becomes of a great deal of it. A man contracts for the distillery dreg there, and it is dried, and sent to Hull.

9493. It is not largely used in Edinburgh?—No.

9494. (*Chairman.*) What is it sent to Hull for?—I fancy it is used to adulterate cake myself.

9495. (*Dr. Voelcker.*) I am afraid I must agree with that remark?—I fancy it is so, but I do not know.

9496. (*Major Craigie.*) We may take it that the distillery business near Edinburgh is a very large one?—Yes, it is, but the brewing business is much larger.

9497. Youngers and other large brewers there have a very large amount of grain?—Yes.

9498. But there would be nothing inherently improbable in the use of distillery dreg?—No, only I know it is dried to a large extent there. There is a factory nearly as large as the distillery for drying this substance.

9499. It is probably within your knowledge that this question of the use of distillery dreg was one of the most prominent matters of discussion in the United States when the question came up for discussion there?—Yes. If I am right it is prohibited as a food there; I think the United States Government do prohibit it as a food.

9500. I think not the United States Government, but perhaps the Governments of several of the separate States used this as one of the strongest arguments for raising the standard, of which we have heard any evidence that the use of distillery dregs has a very deleterious effect on the composition of the milk, and on the health of the cows themselves; but you are clearly of opinion that no great quantity is used in Edinburgh?—I do not think any great quantity of dreg is used; but there is very little chemical difference between dreg and brewers' grains; there may be a little more water in the dreg.

9501. I feel that I am entitled to ask you one or two questions on this meeting, as you stated that you were present. After your statement a speaker, whose name is not given, seems to have referred to a particular case which you mention in your report of 2·6 per cent. of butter fat in a sample of milk, and to have remarked that it was from his own dairy, that he knew the circumstance, and that it was genuine unadulterated milk; but he went on to say that he had been feeding his cows on "taties" and Indian meal; is that a common form of food?—I should hope not. There was no one else at the meeting who had been feeding his cows on "taties" and Indian meal.

9502. That is not common?—I do not think so.

9503. You are aware of the fact that potatoes are used?—Potatoes are used I know.

9504. And used in Scotland to an extent they never are in England?—That is quite true; I know that.

9505. Are they boiled when they are used?—They are not boiled in Edinburgh.

9506. Are they used raw then?—Yes.

9507. So in several particulars you have a mode of feeding in Edinburgh which is rather distinctive?—It is.

9508. And inferior?—And inferior; I admit that.

9509. And it is on the basis of those particular cases that you advocate 2·75?—That is so.

9510. (*Mr. Barham.*) You refer to the distillery dreg, did you call it?—Yes.

9511. Does drying it alter its character altogether?—No.

9512. You speak of it being an improper food for the cow. You know, I dare say, that a great many of the brewers now dry their grains and sell them in that condition?—The drying would get rid of a certain amount of volatile acid and water, but otherwise it would not alter the character to any extent.

9513. It would still be more or less injurious, you think, if it were dried?—I should not like to give an opinion on that point. I have never had it brought under my notice.

9514. (*Dr. Voelcker.*) Do you wish us to understand that in the minds of the magistrates there is present no idea about any standard existing?—Just one correction, please. It is mainly before the sheriffs, remember, that those cases are heard, not before the magistrates, and I do not think, in the minds of the sheriffs—well, there is no standard. Both sides have been asked repeatedly what is the standard? and there is no standard. They have asked the Clerk of the Court what is the legal standard. There is no legal standard.

9515. So that practically they have gone on what is the produce of the cow?—Yes, practically.

9516. And you have been willing to support that?—Yes.

9517. But you must be aware that in the case of dispute between analysts, there is liberty to refer the reference sample to Somerset House?—Yes, I know.

9518. And you yourself must be very well aware by what standard that reference sample would be judged?—You must not blame me for anything of that sort, because I have nothing to do with that. If they want to send the sample to Somerset House they are quite at liberty to do so.

9519. I think you are aware that Somerset House would have a standard?—Yes, certainly.

9520. You have agreed to that standard?—At one time, when it was 2·75. I think the present standard is a little bit too high.

9521. Put it at 2·75—you have agreed to that standard?—Yes, as a fair average standard. Of course, I must add this, that you would occasionally come across milks which might be all quite genuine milks, and yet would not come up to that standard. These are exceptional cases.

9522. But if a sample had been referred by the magistrates to Somerset House, it would have been again reported on as adulterated and in agreement with the opinion of the public analyst?—Yes, it might be.

9523. Although, when the case was before the court you have given evidence to the effect that you could not state that it was adulterated?—Yes. You are putting an answer in my mouth not exactly in the way in which I would put it. I state that, for all I know, and from all analytical evidence, that has ever been given on the point, it is quite possible that this milk might be genuine milk.

9524. So that you have really gone not upon a standard which you know was held by Government authorities and analysts throughout the country?—I will not say analysts throughout the country, because I have had other analysts to support me in some of these cases.

9525. Would any of the members of the Society of Public Analysts have gone below 2·75?—Not as a standard, I have no doubt. But the question before the court is not, Is this a quality of milk that should be sold; the question before the court was, and is: Is it genuine milk as it came from the cow or not? That

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is all they have to settle; they have not got anything to settle about the quality.

9526. But you have taken into account not the standard but the fact as to whether it is the produce of the cow?—That is so. That is all the point that I have been asked to settle.

9527. Although you knew quite well if this case had been referred to the Government authority a certificate would have come back stating that the milk was adulterated?—Yes, it might have been.

9528. If that is your position what is the use of a standard at all to you, or did you have a standard at all?—You must have a standard of what the average quality of the Edinburgh milk is; you must take that as a standard.

9529. But if your standard is anything which the cow produces?—No, you cannot say that; you get abnormal results sometimes.

9530. You get abnormal results sometimes, but you go into court and support a case of figures which are just possible ones for a cow to give?—Yes.

9531. And you lead the magistrates to believe that that is the standard by which things are judged?—No, I do not talk about standards at all. I simply say that to my own knowledge, and the knowledge of others which has been published, it is quite possible that this milk is genuine milk as it came from the cow, but that it is milk of a poor quality. That is all I can say.

9532. You have led them to believe that they are quite justified in having no standard?—No, I do not think I have done that. They are justified in saying that there is no possibility of a standard in the way of what may or what may not come from a cow; but I have never said anything about a standard of what should be sold as milk. That is the point where you and I are differing. There has been no standard hitherto, and you have simply had to prove, Is this milk genuine or not; is it possible that that milk has come from the cow?

9533. Is the Government laboratory no authority?—Yes, as to their own standard.

9534. On their own standard these cases would have been punished?—After all it is a question for the Sheriff or the magistrate to settle; it is nothing to do with me.

9535. These cases anyhow on the Government standard would have been in support of the Public Analyst?—Yes, I suppose so.

9536. And your evidence has been to the effect that the milk has not been adulterated?—Yes.

9537. Which shows that you have not gone upon the standard which you assert you did, but that you have gone upon the question of whether it was the produce of the cow, or not?—That is so.

9538. In other words, you have led the magistrates to believe that there was no authority and that anything that came from the cow was milk?—There is no authority; you cannot have a natural standard of milk that might come from a cow—it is utterly imposssible when you have got such great variations.

9539. You have had no standard?—No, you could not, and there is no standard really.

9540. When you have refused to take up cases and support them on behalf of the association is it where the public analyst has already reported adversely?—I should say so.

9541. And did prosecutions result?—Yes, certainly. In some cases they have pleaded guilty. I have seen the case in the paper afterwards, and have seen that they pleaded guilty and have been fined. One man, I remember, was fined very heavily, not so very long ago, for supplying milk to the poorhouse. I forget his name, but it was a case of added water. I refused to defend it, and I think he was fined £10 in each of three cases.

9542. In cases of watering milk, you do not find discrepancies between yourself and the public analyst?—No, we agree.

9543. How many cases of watering came before the Courts?—I really could not say.

9544. The public analyst tells us that it is very uncommon. Is that your experience?—I think it is very uncommon. It is chiefly fat.

9545. That practically does not come in question?—No. I think I have said that in my *précis*.

9546. But as regards the abstraction of fat, which is the prevalent form of adulteration, you are generally in disagreement with the public analyst?—That is so.

9547. (*Mr. Cowan.*) I think it is your opinion that the normal quality of milk, as produced by a cow, cannot be very much improved by extra feeding?—That is so.

9548. Then do you think that it can be very much deteriorated by the use of inferior feeding?—I certainly think so.

9549. That is, it can be more deteriorated than it can be improved?—Certainly.

9550. And by the use of the food which is so very extensively fed in Edinburgh the milk is certainly brought down below what would be a sort of normal yield of the cows?—That is my opinion.

9551. Would it not be your opinion that milk which was brought down by improper feeding should stand as adulterated milk, and be in the same position?—No.

9552. Not if there was a standard fixed?—Not altogether, because it is the feeding which they are almost bound to carry on there. It is the feeding of the district.

9553. You can change it?—What are you going to change, and how are you going to bring about the change.

9554. If there is a fair standard fixed it is likely they will have to change. They are bound to do it?—It will be a very unfortunate thing for the dairy keepers.

9555. I do not see why they cannot use more albuminous food along with the brewers' grains, and so keep the quality up?—They can do so, but it will be by increasing the price of milk.

9556. The farmers all over the country have to struggle against that?—It is almost impossible to foretell what will happen in a case of that sort. It will certainly alter things altogether if carried through. There is no doubt about that.

9557. Still, you would allow that a standard could not be fixed just to suit the City of Edinburgh?—I think it would be hardly fair to judge the City of Edinburgh milk by the standard of milk in the South of England, for example. It would be hard on the feeder to go and upset the whole of that all at once.

9558. But if they get due notice, say, six months' time to prepare, could they do it?—I daresay they could. I have no doubt that they could, but up would go the price of milk. There is no doubt about that.

9559. Then in that case they could secure themselves? It would be the poor consumer that would suffer, not the retailer?—That is quite true.

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Dr. JAMES NIVEN, M.A., Cantab., called; and Examined.

9560. (*Chairman.*) You are medical officer of health in Manchester, and you represent the Association of Municipal Corporations?—Yes.

9561. May I ask if the evidence you propose to give us is the result of the conclusions arrived at by the Association of Municipal Corporations, or are you going to give us your own personal views?—They are my own personal views. I have no direction from the Association of Municipal Corporations, or from any representative of the Association.

9562. You do not represent the united views of any body?—I do not. I have had no suggestions from any one, nor consultations with any one belonging to this association as to my evidence.

9563. Did not the Association of Municipal Corporations nominate you on their behalf?—They did, but they gave me no guidance.

9564. They gave you your head quite loose?—They did.

9565. Then the evidence you will give us is the result of your own experience, and the conclusions you have arrived at from what you have observed yourself?—Yes.

9566. You have given us a good many figures as regards the question of infant's milk as compared with cows' milk, but I do not think it is necessary that we need labour that point at all?—Yes, I simply gave those to show that the composition of human milk is

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respect of fat and sugar is higher than that of cow's milk, and thereby to show that it was necessary to maintain a high standard in feeding children; the more so, of course, that one has to manipulate cow's milk in a particular manner in order to make it possible for the digestion of infants, in a manner which still further reduces its nutritive value.

9567. I suppose we are all agreed on the fourth statement in your *précis,* namely, that it is important that the percentage of solids not fat should be adequate as well as that the percentage of fat should be adequate?—Yes, I think so.

9568. The question arises, what is adequate; what is a fair standard to fix these two quantities at?—I should prefer, however, to adopt the course taken here, and not to fix solids not fat, but to fix a fairly high percentage for total solids and for fat.

9569. Total solids so much of which shall be fat?—Yes.

9570. What are the figures that you suggest?—Total solids 12 per cent., and fat 3 per cent. Of course, I am aware that that is a comparatively low standard, but I do not think it is desirable to go above that, taking into account the present circumstances of the country.

9571. Perhaps you would kindly tell the Committee what are the reasons which cause you to take those points as your idea of a standard?—I am aware, of course, that the standard of the public analyst at present is 3 per cent. of fat and 8·5 per cent. of solids not fat. I think that comes very much in one way to what I am proposing, but I think that that particular standard admits of a considerable amount of watering down, and I do not think it is desirable to fix a standard in that way for that reason. I think by fixing the standard at 3 per cent. fat, 12 per cent. of total solids, you incur a much less danger of having the milk tampered with, at any rate by watering, than you do with a standard of 3 per cent. of fat, and a standard of 8·5 for other solids.

8572. You have a record of control samples taken during the five years?—Yes.

9573. Perhaps you would tell us what the practice in Manchester is in dealing with samples?—The present practice, I am informed, by the analyst, is to take out the total solids by evaporation, and to take out the fat by the Adams coil method, but these particular samples have been got under a previous system of analysis, so that they represent a lower percentage of fat.

9574. When were these samples taken?—In the course of the last five years.

9575. Do you know what process they were analysed under?—I believe the Wanklyn.

9576. That would give you a very much smaller percentage of fat than the Adams' process?—Yes. I have taken out the total solids, and they would show the quality of the milk quite well. If we take the first sample with 2·10 of butter fat and 16 cows that gives 10·90 for the total solids; the next one with 2 per cent. of fat and 8 cows gives 11·45 of total solids; the next, which is a double sample from the same farm, gives in the first instance total solids 11·45, and in the second sample 10·55; and the last one gives 10·50 of total solids. The quality of the milk in all these instances is extremely poor.

9577. What is the history of these samples that were taken; what caused them to be taken in the first place?—Those samples are taken in this manner. Supposing a sample from the retail man is found to be below what I call the standard of reference, because in the case of Manchester it is merely a standard of reference, and it is not a fixed standard.

9578. What is the standard of reference in Manchester?—3 per cent. of fat and 8·5 per cent. of solids not fat upon the Adams' coil method. When a retailer's sample falls below that figure then a sample is taken from the middleman. That is to say in this way; the inspector lies in wait until the middleman's cart comes up to deliver the next supply of milk at the retailer's, and he there and then takes a sample in the process of delivery. Then he goes to the middleman, who, owing to the practice prevailing in Manchester, is always able to tell him from which farmer the sample has come, because they send the farmers' milk direct on to the retailer, keeping it separate. This sample taken from the middleman is submitted to an analyst, and if it in turn is inferior the inspector takes another sample at the station from the farmer who has sent the milk. If that in turn again is of inferior quality the two inspectors under the Sale of Food and Drugs Acts go out to the farm and take what I call a control sample of the average milk from all the cows on the farm. They do it in this way in order that the farmer shall not suffer. Supposing the farmer has sent in two churns or three churns, it is well known what cows belong to each churn, and they take an average sample from the cows belonging to each churn; that is to say they may take as many as two or three controls at a given farm in order to check the milk taken at the station. It is very thoroughly carried out.

9579. Would you mind going a little closer into it; say you take the sample of the retailer on the first of the month, if that is below the standard then you go to the middleman; on what day would you go to the middleman?—Two or three days afterwards.

9580. Then the middleman's sample is found below the standard, and you go to the churn, how many days afterwards?—The same interval.

9581. Three days?—About three days.

9582. Then if the farmer's churn is found below the standard it would be about the 10th or 14th day before you go down to the farm?—That would be so.

9583. Therefore the sample that was taken on the farm has nothing whatever to do with the sample that was taken originally on the first of the month?—Only supposing the sample to be deemed an inferior milk there is no likelihood of the milk having changed its character during that period. It is from the whole herd; it is not from an individual cow.

9584. Still we have had it in evidence that a fortnight by the changes of weather may make a considerable difference in the production of the cow; the quality of the milk may vary very much; if the original sample was taken when the weather happened to be very cold and wet, and then warm weather set in, the circumstances might be very different a fortnight afterwards?—I should hardly imagine under the circumstances in which our cows are housed that the weather would make so very much difference. I am aware from the evidence I have collected myself that one farmer did ascribe the change to the weather. That was a case in which the cows were housed, and as I know the conditions of housing I should think that that was imaginary. I can still understand, however, that in the grazing season, there might be a very considerable difference indeed in the pasture of the cows; but if the cows are well fed to begin with, and there is no reason why any cow should not be well fed, the difference in the pasture would make very little difference in the milk; if the cows are very badly fed I can conceive that it would.

9585. I am not talking of pasture; I am talking of temperature?—That is if the cows are outside.

9586. Yes?—They would only be outside in the summer, and I do not think it would make very much difference.

9587. Let us follow this up; the farmer shows that his cows, we will say, give a much better sample than you would expect from what you had found; what is done then; who is prosecuted?—The farmer is prosecuted in that case.

9588. If his cow gave a poor quality of milk nobody is prosecuted?—If, that is, the low quality of the milk approaches the sample taken at the station.

9589. Then under this system the retailer and the middleman never get prosecuted?—Yes, because supposing the sample taken at the station is better than the middleman's, and supposing the middleman's is an inferior milk, he gets prosecuted; supposing the middleman's milk to be good and the retailers to be bad the retailer is prosecuted. Of course, you catch them at each step.

9590. It is rather difficult; you get such different milk each time?—Of course, a man might adulterate on one day and not on another, conceivably, but as a matter of practice I think you may assume that in the great majority of cases the man who puts water in one day will do so the next. At all events, it is quite evident from the figures which are given that a very large proportion indeed of the control milks are bad.

9591. Just take these control milk supply samples, as you call them. You say that 20 of them give less than 3 per cent. of fat out of a total of 36?—Yes.

9592. And 6 give less than 2·5 per cent.?—Yes.

9593. These are samples of milk taken actually on the farms?—Yes; this again would be by the Wanklyn process.

9594. That rather alters it?—That rather modifies it.

9595. (*Mr. Barham.*) It would not alter the total solids?—It would not. The total solids are obtained by evaporation, and carefully dried down to a constant weight of the milk; of course the total solids could not be altered.

9596. (*Chairman.*) At all events, as regards the fat these figures are hardly correct?—I have a statement here with regard to the total solids of 119 of these control samples. I find that from 12 per cent. to 11·5 per cent. there were 38 samples; from 11·5 per cent. to 11 per cent. 19; from 11 per cent. to 10·5 per cent. 7; and 10·5 per cent. and under—2. That gives at all events a picture of the total solids for all the control samples; and that is entirely independent of any method adopted of the extraction of the fat.

9597. In the case of these control samples, which were deficient or apparently deficient in fat, were prosecutions instituted?—No, no steps were taken at all. I may say that I think that is liable to lead to a low quality of milk. Under these circumstances naturally farmers will buy cows for quantity rather than for quality, and they will feed in such a way as to produce, so far as that is possible, quantity rather than quality I do not know how far that is possible, but it is said that by feeding cows upon brewers' grains and roots, you can, to a certain extent, produce quantity at the expense of quality. At any rate, they will buy that kind of cow, it is pretty obvious, which gives a large quantity of milk, irrespective of the quality. I think that is a bad state of things.

9598. It should not be encouraged?—I think that should not be encouraged.

9599. In fact, you think the standard should be fixed in such a way as to discourage that class of cow which produces that kind of milk, and that we should aim at getting a higher class of milk for the consumer?—Yes. I think one might also recall that an American authority who has collected an enormous amount of facts—Professor Henry—states that, supposing a cow to be well fed at the height of lactation, and kept well fed with a proper ratio of albuminous matter to the carbohydrates, there is an absolute profit—that so far from there being a loss by adding rich food to the ordinary fodder it is an absolute profit to the farmer. Professor Henry shows that in his book I think quite conclusively, so that I do not think any hardship is inflicted upon the farmer by requiring that he should rise to a higher standard than that which he now attains in many instances.

9600. What do you think that standard should be?—I think the standard should be 3 per cent. of fat and 12 per cent. of total solids. There may be a question, of course, whether the standard should be a fixed one or whether it should be what I call a reference standard with a system of controls such as exists in Manchester. I do not think you can altogether do without the control system, because I think the figures which I give as showing the operations of the sanitary committee of Manchester prove conclusively that a very large number of samples taken from retailers and middlemen, and found to be inferior, would be classed as adulterated under the ordinary operations. A very large proportion of them inded are really adulterated by the farmer. If you take no control sample in the way that I have mentioned you expose those men at all events to being brought up for fraud. I may just mention the figures taken at the station, that is from the farmers. There were 2532 of those samples taken, and of those 461, or 18·2 were found to be adulterated. The great majority of those, nearly all of them, in fact, are control samples. It is manifest that, supposing no control of this kind had been exercised, and the retailers had been prosecuted, a very great amount of hardship would have been inflicted upon them. I do not think whatever may be settled, that part of the administration should be lost. Personally I think a fixed standard is better than a mere reference standard, but at the same time I should not give up that part of the administrative procedure.

9601. Were these samples judged by what you call a reference?—Yes. All those samples are referred to a standard of 3 per cent. of fat, and 8·5 per cent. of solids not fat.

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9602. Were they analysed by the Adams process?—Yes.

9603. And failed under that test to come up to the standard you have mentioned?—Yes, that is so.

9604. Were prosecutions instituted in those various cases?—Yes, wherever they are stated to be adulterated that means prosecution.

9605. Can you tell us if convictions take place generally?—Yes, certainly. I do not know that convictions took place in every case, but convictions took place in the great majority of them. Attached to those tables that I have sent up you have a report of the sanitary committee, and a long table which gives the total operations, and states the number of prosecutions.

9606. (*Mr. Barham.*) Manchester is the model town of the kingdom in this respect, and by means of their control system they have I think a better supply than any other town in the kingdom?—I think the gross result even making allowances for the defects of the control system has been entirely good. In 1892-93 1,145 samples were taken, and of these 57 were adulterated, in 1893-4 1,048 were taken, and 59 were found to be adulterated; in 1894-5 1,078 were taken and 38 were found to be adulterated, and so on. The percentage has steadily diminished year by year. The highest is in 1879-80, when the percentage of the adulterations was 34·3; that sank to 1·55 in 1898, and last year 2·76.

9607. The percentage of prosecutions do you mean?—Yes. It is quite easy, following these tables to see that the big reductions have taken place at two different periods—on the first occasion owing to a large increase in the number of samples taken. The next big reduction was owing to putting on an extra inspector, and, therefore, doubling the work. As the Act of Parliament has been more efficiently enforced, so the proportion of adulterations diminishes. It is very evident, on following the tables, that that is so.

9608. (*Mr. Farmer.*) It would be as well to get on the minutes the reason you give for the high percentage of adulteration by farmers?—The percentage of adulterated samples obtained from dealers is seen from Table 2 to be 6·52. This figure will undergo a considerable increase if we take into account the fact that the samples include not only all obtained in the first instance from dealers and middlemen, but also all the control samples obtained from middlemen. The percentage of adulterations by farmers is shown by Table 3 to have been 18·20. If we deduct from the number of samples those taken as controls, the percentage of adulterations on the remainder is 20 9. The two classes of samples are not directly comparable, as the majority of the samples obtained from dealers are unselected, while the samples taken from farmers' churns at the station are chiefly pointed at by previous bad milks obtained from the dealer. This is the reason why the farmers' milks give a higher percentage of adulteration than the dealers'.

9609. Have you anything to show what the later years would be as regards the practice of the farmers?—That is quite evident from a table which I call B.4, which shows the number of samples taken at the farm direct from the cows in each year since the Act came into force. The number was: in 1883-4, 43; and for the successive years to the present, 18, 27, 17, 46, 36, 32, 23, 17, 9, 15, 11, 5, 15, 10, and 9; so that from ten years ago there is a very great reduction indeed. Perhaps one may say there is only a third of the defective samples found at the station now that there were ten years ago; evidently the effect has been to produce a better quality of milk coming from the farm, that is quite clear.

9610. (*Major Craigie.*) Are the total numbers much greater in later years?—The total should be much less.

9611. (*Chairman.*) Will you proceed, please, with what you have to tell us?—I would not on any consideration have a lower standard either fixed or relative than 3 per cent. of fat and 12 per cent. of total solids. I think the best thing would be to fix an absolute standard of 3 per cent. of fat and 12 per cent. of total solids in this sense, that a dealer who could not refer to the farmer should be prosecuted upon that standard—that that should be the standard for determining adulteration. As to the farmer supposing that on going from the station to his farm the average milk taken at the farm proved to be below the standard, and near the standard of that taken at the station, I

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should be content at the time to inform the dealer of the facts as well as the farmer. Then I should send, as we have been doing lately, our expert veterinary-surgeon, who has gained special skill in this matter, to the farmer, to consider the best means by which he may change his stock and alter his methods of feeding—in fact to give him instruction in the proper way to produce milk. I should, I think, only give him twelve months to rehabilitate himself. After that I should not take any more controls, and I should judge him by the absolute standard; that is, supposing that there were a fixed standard.

9612. (*Mr. Farmer.*) That seems to be making a fresh Act of Parliament?—The circumstances are extremely complicated. If you were to do that you would have to alter your form of certificate, and change the word "genuine" to "normal." The word "genuine" is a very misleading word, I think; and does a lot of mischief because there is no doubt that even with the present standard you get farmers fined who know perfectly well that their milk has not been tampered with, and I think that is about the most unhappy state of the law that could exist, and will lead to evasion. I think that where you create a sense of injustice and there is no security about the action of the law, you will have evasion. I think, therefore, that it would be absolutely necessary to change the word "genuine" in the analysis to "normal," so that there should be no mistake as to the ground that you have taken up.

9613. But "genuine" is the word used in the Act of Parliament?—Then I should think the next best course is still having the same standard of reference.

9614. (*Mr. Barham.*) What standard?—Three per cent., and 12 per cent. of total solids—not a fixed standard, but a standard of reference; and you should use the Manchester system of controls, and when your milk fell below that standard, then follow it up till you get to the farm, and any milk falling below the standard you would pursue to the farm, and instruct the farmer in the same way as to the proceedings to be taken. I do not think that so good a thing as the fixing of an absolute standard, I do not think you would get anything like the same results from it, but I think it is the next best thing.

9615. Can you tell us the percentage of samples in which the appeal justified the cows?—If you will kindly allow me I will work that out; it is all contained in the figures here, but it wants working from them.

9616. (*Chairman.*) Would you go on with the various points you wish to bring out, please?—I think I have already mentioned that I consider the large number of adulterated samples taken from farmers as a control upon inferior milks obtained from the middlemen is a very powerful argument for continuing the system of controls, because all these middlemen, of course, would have suffered. I think it is a very remarkable thing that they have not taken more pains to protect themselves by testing the milks coming to them, but still these are the facts that those milks have come to them, and that they have been inferior, and that that inferiority has been traced in a very large number of instances to the farmers. It is evident that a system of control samples of this kind does protect the honest middleman.

9617. Does the middleman in Manchester not take these samples for himself?—Apparently not; I do not see how all these samples could have escaped him, if he did. Of course he may trust to the Corporation; knowing that a system of controls of that kind exists, he may not think it necesary to control his own samples.

9618. It is evident that is what he does; your inspection apparently is so very good and worked on such good lines, that he can feel himself safe in your hands; it says a great deal for the manner in which it is done that they should leave it to you?—It is very thoroughly done, but I think it is well to indicate one serious danger in the control system. Supposing a dealer does make an analysis of his milk such as obtaining the fat by Gerber's machine, which can be worked very quickly, and he finds that a certain farmer is sending him a poor quality of milk, what is to prevent him lowering the whole quality of his milk to that poor sample, and then when the sample is taken at any part of his supply, and is found inferior, referring the Corporation to the poorest farmer as an example of what is being sent to him? I think that is a danger to which the thing is liable, that it at all events enables the middleman to lower the quality of his milk

9619. The general quality of his milk do you mean?—Yes.

9621. (*Mr. Barham.*) But in that case the middleman must have a rogue to deal with at the farm before he can begin to lower his own milk down?—It all depends on what you mean by a rogue. A man may send in poor milk, but that may be from poor cows, and poorly fed cows. Supposing, for example, with several good milks there is one farmer sending in a milk at 2·5 of fat, or something like that; what is to prevent this middleman from lowering the whole quality of his milk sent in from good farms to 2·5 of fat, and then if you found a sample anywhere in his area of supply giving this 2·5 of fat he says you must go to this one—naming the farmer that gives the 2·5 of fat. It is open to that danger.

9622. (*Chairman.*) It is in a way, but we have had evidence to show that if a man mixes the milk from one source of supply with the milk from any other source of supply the average is so good that that is perfectly safe; in point of fact what you are alluding to is done by the Aylesbury Dairy Company and all the big dairy companies—the weak milks are mixed with the strong ones?—That is not my suggestion. My suggestion is, what is to prevent them all watering or abstracting fat, or what not, lowering the whole quality of the good milks to this very poor sample, and, then, when you catch a poor sample anywhere on his area, referring you to this very poor farmer. It is open to that objection. So you would be liable to escape catching the middleman in that way; he might escape your clutches altogether, and yet he doing a trick of that nature. That is possible. I think it is necessary in considering what one should do to have one's eyes open to this possibility, because I think there are very few things which are not found out and acted upon. It is so obvious a temptation for the dealer to act in this manner that it is a danger which one must have in view. That, of course, is another argument for having a fixed standard. At several places—Copenhagen and at Paris—they apparently adopt the system of control samples. On the whole, I consider that the system of control samples has worked well in Manchester, these points, however, being kept in mind as possibilities. The result has been a great improvement in the public supply.

9623. Is this control system carried out in the districts around Manchester?—Yes. I wish to say that I understand that this control system was initiated about 17 years ago by the sanitary superintendent, Mr. Rook, acting in conjunction with the Public Analyst. Mr. Estcourt acts as the public analyst for a number of other districts, to which he has extended it; I believe it has also been extended to Salford, for which he is not public analyst. He does the same thing in Oldham and other towns where he is public analyst.

9624. You approve so highly of the results of this system that you think it ought to be legalised by Act of Parliament?—It ought to be legalised to a certain extent, because I should also have a fixed standard. I should not legalise this, without fixing the standard; I think the result of that might be to lower the quality of your dairy stock throughout the country.

9625. You think you would prescribe it as the method to be adopted by all local authorities?—I think so. I think it is just to the middleman that it should be done, and unjust that it should not be done.

9626. Instead of it being left now to each local authority to adopt its own methods of procedure?—Yes; I think the facts show that it is only a just proceeding. At the same time, I should not leave the protection of the public to that. I think that the protection to the public would be inadequate if you relied upon that. I think that there ought also to be a fixed standard sufficiently severe to prevent tampering with milk, and not too severe, so that a good farmer may easily come up to it; and that this should be applied directly and immediately to such dealers as could not indicate the milks which were below the standard. Supposing, however, they could indicate those milks, then I would go back to the farm; and if the sample at the farm fell below the standard, I would give the farmer a sufficient period in which to turn round, say, twelve months, to change his stock and his methods of procedure, according to the requirements of the case. Now, as a matter of fact, we have been lately, for the purposes of this Committee, investigating the condition of samples taken at the farms to see on what their poverty or otherwise depended. It is a matter of general knowledge, and our experience entirely bears it out, that by the proper selection of cows, both in the matter of breeding and individually, and by proper feeding, you can make quite sure to produce the standard which I have mentioned.

9627. (*Major Craigie.*) On any land?—The land does not matter, because you can always supplement your pasture, and, in fact, you must occasionally, if you wish to produce good milk. The land is a matter of absolute indifference; it is simply a question of feeding your cows properly.

9628. (*Chairman.*) Did you hear the evidence of the last witness?—I just heard that point; but I entirely disagree with that. It is a matter of experience in Sweden, at Stockholm, that they feed them entirely indoors, and get excellent milk. It is mentioned by Professor Henry and other writers, not as a thing that should be done, but as a matter of fact, that the food of the cow is so supplemented when they go out to pasture. Indeed I believe it is given as a matter of common knowledge that cows when they go out to pasture are liable to produce poor milk, because they suffer from diarrhœa, and in order to prevent that diarrhœa albuminous food should be added to the pasturage. In any case, by proper and judicious mixture of other foods with pasturage there is no difficulty in producing a good quality of milk; not only so, but according to the evidence given in Professor Henry's book it is a profitable thing for the farmer to do so. He gets more milk and of a better quality; he has an absolute profit upon his better feeding; that is to say he gets more out of the milk than he gives for the food which he employs to produce the milk.

9629. The last witness was alluding to cows which are kept entirely indoors, which never go out at all, and are fed on the most stimulating class of food which can be given to them; and the result is that the animal produces a quantity of very watery, washy stuff.' Do you think it is right that the public should be given that?—I do not. I do not think that the public should be given inferior milk. I presume that is, for instance, brewers' grains?

9630. Brewers' grains, mangolds, distillery dreg—sometimes turnips, never hay—potatoes and Indian corn?—If you feed your cows upon materials such as potatoes, which do not contain the necessary albumen, you are bound to get wretched milk. At any rate, I do not think that cows ought to be fed on brewers' grains. I do not wish to make too much of that. It is hardly a question that I think I ought to discuss here, because that may be right in principle as applied to the milk coming into their city; but in discussing the whole milk produce of the country I do not quite care to go into that matter. At all events there is no reason whatever, supposing that such notice was given, why it should not be properly supplemented so as to give a diet containing the necessary constituents; and why you should not get rich milk on your table.

9631. As a medical officer of health entrusted with the care of the health of a large population, would you think it right that milk should be supplied to your people of such a very inferior class as that?—No. I would not.

9632. And that a standard should be set so as to enable that inferior class of milk to be produced as the everyday average condition of things?—Certainly not. I entirely object to that. I do not see why the milk from such food as regards the solids not fat and fat should be inferior, but certainly if that is the only food given, and inferior milk is so produced I should strongly object. I see no reason whatever why it should be done. Perhaps I ought to say that brewers' grains is a food that no model company, no good company, would ever allow its farmers to feed their cows upon. In order to see whether there were not further dangers in this system of controls and the absence of a fixed standard, I thought it well, with the assistance of our expert veterinary surgeon, Mr. Lloyd, to see whether the quality of the milk from cows might not be changed in certain manners. By the assistance of a skilled farmer, whose milk I may say is not only abundant but of excellent quality—so that he understands how to feed—we added to the diet for a week one pound of sugar. Practically for this purpose no result followed. What happened was that the fat was somewhat decreased and the other solids increased upon that diet—probably the milk sugar; but on giving a purge there appears from the analyses which I have handed in to be in both cows a lowering of the amount of fat. There are two control samples on Table E. 2, namely, 1 and 17, and judged by the control sample taken before the giving of the purge and the control sample taken afterwards it would appear that the amount of fat was lowered by the purge.

9633. (*Mr. Barham.*) What was the amount of the fat in the original milk?—In the original milk it was 3·4, but it was taken not a very long time after the afternoon's milking, so I had another sample taken at the normal time, which gave 3·3 of fat.

9634. And after the purge?—2·8.

9635. (*Mr. Farmer.*) Was that purge a medicine, or was it an ordinary laxative food?—It was a purge.

9636. The cow was under the influence of medicine?—Yes, it was.

9637. You could not compare that with a laxative food like grass?—Not at all. This was given for the sake of seeing whether a farmer could lower the quality of his milk in that way—whether he could produce a control sample of a poor quality, and so get off having adulterated his milk. It is in order to test the weak points of this control system.

9638. (*Chairman.*) What do you gather, generally speaking?—It looks rather as though he could. It may not be absolutely certain, but it is quite certain that the quality of the fat is reduced in both these cows by the action of a purge. Of course, he would have to know pretty accurately, when the Corporation were coming, but then he does, because it would always be two or three days after the first sample had been taken.

9639. (*Mr. Barham.*) Do you give him notice that you are going to visit the farm on a certain day?—No. But they know by experience. The inspectors go as soon as possible.

9640. He would not know that the middleman's milk had been analysed or found wanting?—It is not the middleman's; it is a sample taken at the station.

9641. The farmer's milk?—Yes.

9642. He might not know?—He might very easily; I find in working these milk clauses that they do know.

9643. There is no protection for the middleman?—They can arrange beforehand to get to know if they choose.

9644. (*Chairman.*) In this particular experiment the report is that the cow was milked at 9.40 in the evening; that is rather an unusual hour?—The taking of the control at this hour was an oversight, but a control which was taken afterwards is perfectly normal, after the usual interval of milking, and represents the normal milk of the cow.

9645. That is the control sample?—Yes, No. 17.

9646. The purge is given after this evening milking—after 9.40 in the evening?—Yes.

9647. They took your sample just before you gave the purge, and that produced 3·4 in the morning, when your purge was beginning to work, and at half-past six the fat was 2·8?—Yes.

9648. In the afternoon, the purge still acting freely I presume, fat is 3·1; the next morning the fat is 2·7, and then 12 days afterwards you take it in the morning, and the fat is 3·3?—Yes, that is so.

9649. Therefore the two mornings under the influence of the purge produce 2·8 and 2·7, and under natural conditions 3·3?—Approximately that.

9650. From that you deduce that a purge given in this way by the farmer might lower the quality of the milk?—If he chose to adopt such an expedient. Of course that is not very conclusive, and you want more analyses than those, but I may say that I did this because I had a hint that this was a practice that is sometimes followed. Then we also tried salt, because one knows that salt is a material which, taken in quantity, causes a lot of water to be taken, and produces tissue waste. It was supposed, therefore, to be possible that excess of salt by making a great drain upon the nitrogenous material of the body physically might diminish the nitrogen available for the production of milk. The amount given was half-a-pound of common salt on two successive days. The results of that amount do not show that salt can be used, in that quantity, to produce the effect; possibly in larger quantity salt might, but in that quantity it does not produce the effect.

9651. The only effect of the salt apparently is that the afternoon's milking is the one that is low; the morning's milks were all above 3 per cent., and on one occasion the p.m. milk under the influence of the salt produced 2.2?—On one occasion, with one of the cows, it is lowered, and, indeed, in the other cow, it is lower than usual—just a

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little lower; but it is not at all clear. I should like to mention that, in order to establish whether by continuing the system of control it was possible to fix a standard not to be immediately applied to the farmer, but to be applied after he had time to turn round—whether it was possible for the veterinary surgeon, whose services are contemplated under these circumstances, to ascertain what was amiss, to state it definitely, and to advise the farmer and assist him in bringing about a better state of things; I took the poorest control samples which we had, and asked Mr. Lloyd, upon a form which I supplied, to institute a thorough investigation into the condition of the cows, the cowshed, the circumstances of the feeding, and everything which might be supposed to throw any light upon the conditions under which those poor samples had been produced. The full details are given to you on each form. The aggregate effect of the investigation, I think, is to show that when a very poor quality of milk has been obtained at the farm the cows have been underfed. Probably the chief elements are poor quality of stock and underfeeding; the underfeeding comes out very prominently. Of course, it is very obvious that you can lower the quality of the milk by underfeeding. I do not think there is any doubt that on a number of farms poor cows are obtained, and they are so wretchedly fed, possibly from want of knowledge, and possibly, also, to get as much out of them as possible, that they will give these poor qualities of milk. I consider that it is quite as necessary to stop that condition of things, though with every regard to justice and with every consideration to the farmer, as it is to stop the dealer from putting water into milk or mixing it with skim or separated milk.

9652. How many of these experiments did you conduct with these poor class milks?—There are eleven of these inquiries.

9653. And the results are, so to speak, constant—the same causes produce the same results in different forms?—I think, practically, one may say that we found that the cows had been poor and were underfed, or that they had been ill. I may mention that in one case the sample taken in the town, there were nine in the herd—it was not a very large herd—which had been condemned just before the sample was taken on account of tuberculosis, and all of them were found in a very advanced stage of the disease, two or three with tuberculous udders.

9654. (*Mr. Farmer.*) Have you any cases of grass milk in May and June, are all shed cows?—I think there are one or two, but I should have to look through the whole.

9655. (*Mr. Barham.*) Were any of them taken in May and June, do you know?—Here is one—on May 1st, 1895. I know about those cows; they are fed for the purpose of producing manure, which is used in the dye works; the result is that they are fed on brewers' grains, and produce a very loose manure, which alone is useful for the purpose of the dye works. That is scarcely applicable to your question. There are other samples taken in May. On May 11th, 1896, there is a sample giving 2.1 of fat out of one lot of cows, and 2.7 out of another.

9656. (*Mr. Farmer.*) Are those shed cows or fed on grass? What do you mean by poorly fed, that is what I want to get at?—I will look up this particular one if I can find it, because it is an interesting case otherwise. From the same farm lately we have found two tuberculous udders and four suspicious ones. The two proved to be tuberculous after the milk had been taken from the udders. Considering how rare a tuberculous udder is, that is rather striking. In regard to the case which I mentioned in which the poor quality of the milk was ascribed to the weather, the farmer explains that by stating that May, 1896, was very cold, the east wind being very prevalent and feeding stuffs scarce; several cows also were fresh calved—not that that makes much difference, but evidently the cows, on his own statement, had been underfed. That is the second instance of extensive disease coinciding with poor milk; and there are other cases in which the same thing occurs. That probably implies no more than that cows kept in a wretched physiological condition are more liable to disease than other cows. In regard to cows that were kept for dyeing purposes, the note made by the veterinary surgeon upon the present condition of feeding, was that the cows are in good condition, and were being pushed by feeding to increase the milk supply. They were having clover hay, meal and brewers' grains. There were 72 bushels of the grains fed per week, 12cwt. of Indian meal, and a ton of mangolds, the amount per week for each cow being 3½ bushels of brewers' grains, 70lb. of Indian meal, and 161b. per day of mangolds.

9657. (*Mr. Barham.*) It was produced under that special feeding that he describes?—Under this special food—a very light and nitrogenous food—the milk produced showed solids, not fat, 9 per cent. and fat 4.4, which, of course, is a very excellent quality of milk.

9658. Was that one of the poor farms?—That was one that gave a previous very poor sample on the occasion when we ascertained nothing about the state of the cows or the feeding. I think the probability is that they were giving chiefly brewers' grains before, and that they had improved the quality of the feeding; of course, that is mere surmise.

9659. (*Chairman.*) Is that all you have to say on the feeding?—The details are so abundant; there is a synopsis of individual farms investigated which I have sent in.

9660. But you do not wish to enlarge on that any further?—No, except again to express my opinion that the farmer may, with the aid of expert veterinary surgeons, gradually renew his stock and produce good milk. I see no reason why he should not. Give him a little time, and there is no reason whatever why he should continue to produce these poor samples of milk.

9661. In point of fact, to sum up, you think a fairly high standard can be fixed, and where farmers do not now give milk coming up to that standard they can be got to do so by careful watching and feeding of their stock?—Yes; and that it will be no disadvantage to them, but the contrary.

9662. And that they will benefit as well as the consumer?—Yes. I may remind you that evidence from personal knowledge was given by Mr. Long to the Select Committee from Boston and Messachusetts to that effect.

9663. We shall have a statement in regard to foreign countries. You have nothing to tell us on the matter of cream, have you?—I think not. As a matter of fact, we have not taken samples for the purpose of controlling creams.

9664. As an ordinary consumer yourself, if you require cream do you think you require a standard to protect you?—I do not quite see what the standard is going to refer to.

9665. You can protect yourself, in point of fact?—I do not quite see what the standard is to be for. Everyone knows that naturally cream varies very much in point of condensation. As regards the amount of water in it, you cannot fix that. One can protect oneself in a rough way. I do not see what the standard is for; if I knew exactly what the point is, I might be able to answer you.

9666. We are asked to say if we can recommend a standard for cream, and we are asking our witnesses if they can advise us on this point?—I should say not. I do not see that you can fix a standard for cream, if I understand the subject.

9667. As regards condensed milk, has that come under your observation much in Manchester?—Very few samples have been examined, and those only recently.

9668. Is much of it consumed in Manchester?—A great deal.

9669. Do you believe that the people get a very bad quality of condensed milk?—On the whole, I do not. I think that the only thing we have suffered from has been insufficiency of information with regard to the quality of the milk; and under the new Act I think that will be all right, as the labelling will be quite distinct. I think that that is all that is required. I think, as regards judging whether a sample of condensed milk is skimmed or separated milk that you must take the standard of normal milk and subject it to the same standard—diluted, that is, in the proportions stated on the label.

9670. And that the labels on the tins of condensed milk should state clearly what the constitution of the milk is and what amount of condensation it has been subjected to?—Yes. It should state the proportion which is necessary to dilute it to form normal milk.

9671. That comes to the same thing?—Yes.

9672. (*Mr. Barham.*) You say in your *précis*, as the law at present stands a standard so low as 3, or even 2·5, per cent. of fat, and 8·5 of solids not fat, if applied directly to determine adulteration, will include a certain number of undoubtedly genuine milks. That is your opinion?—That is from ascertained fact.

9673. You suggest that we should fix a standard of

12 per cent. total solids, of which not less than 3 per cent. should be butter fat?—Yes.

9674. With a view of getting over the difficulty, you further suggest that the breed of cows in the country must be improved, that the feed of the cows of dairy farmers must be altered and improved, and that the word "genuine" must be eliminated from the Act of Parliament and the word "normal" inserted in its place?—Yes, substantially that is it. May I say that I do not think this will be so very difficult?

9675. You have already said that, but I want to make it clear, because our evidence is so long and continuous that unless one gets it concentrated at some point it is apt to be lost in confusion. Then you say that the Aylesbury Dairy Company's milk shows an average of 4 per cent. of fat, and that the average of solids not fat in one year does not exceed or does not much exceed 8·75?—Yes. That is taken from the report of the Select Committee. I just copied that in support of my argument.

9676. I presume you had those figures and that fact, if it be a fact, in your mind when you suggested 12 per cent. of total solids?—Yes.

9677. Probably that suggestion was largely based on the enormous number of figures which the Aylesbury Dairy Company produced?—Yes; it is based upon that and the other facts I have brought before the Committee.

9678. I think you refer somewhere to Dr. Vieth and to Mr. Richmond?—Yes, I say I have taken their figures into account.

9679. Should you be surprised to hear that, taking all their figures into consideration, the dairy chemist of the Aylesbury Dairy Company, Mr. Droop Richmond, was here yesterday and recommended a standard of 3 per cent. of butter fat and 8·5 of non-fatty solids?—Yes, I think I should be somewhat surprised. Taking it from my point of view, I think that that standard is liable to lead to more adulteration than the one which I propose, which is not necessarily a more severe one.

9680. Is it not somewhat singular that you, reading the figures, and knowing nothing apart from those figures in connection with the management of the Aylesbury Dairy Company, should suggest 12 per cent. of total solids when they themselves suggest only 11·5?—No, that does not follow at all. If you fix a standard of 3 per cent. of fat and 8·5 of solids not fat, that is not to say that the total solids are to be only 11·5; that is not the same thing at all. I am not sure that that is not a more severe standard than that which I prefer. I think mine is better for the purposes of securing good milk.

9681. In that case, if it is not a less severe standard, you would not object to the 3 per cent. of butter fat and 8·5 of solids not fat?—I do not like that way of fixing it. I prefer the other—3 per cent. of butter fat and 12 per cent. of total solids. I think it will be a pity to go below that.

9682. Should you be surprised to hear that Dr. Vieth suggests that 2·75 of butter fat should be the limit at which prosecutions begin?—I think that is too low. That is my impression from all the facts that I know. I may say that I have handed you in a table showing a considerable number of analyses, which have been taken at ordinary average farms round about Manchester, which shows a much higher quality of milk than that taken recently for the purpose of determining what one might reasonably expect from the average farm.

9683. We are not dealing with average farms here nor with average milks. We are dealing with the lowest limit at which milk shall be presumed to be adulterated. Of course, averages are a different thing altogether. You do not prosecute your retail dairyman upon the average of the milk he has sold during the year, nor yet upon the average of the samples you get during the year, but you prosecute him or the farmer upon the lowest sample that you purchase of him. Therefore, I take it, the limit should be the limit that you would permit an honest genuinely produced milk to pass the standard, and would not render the retailer or the farmer liable to prosecution for fraud or otherwise?—My point is that the better quality of milk can be produced by the proper selection of cows and the proper feeding—and produced easily.

9684. Have you any information from your veterinary expert as to the number of ill-bred cows it would be necessary to eliminate from the respective herds?—No.

9685. Probably it would not have very much effect unless 20 per cent. were taken?—I cannot say. It would be a very great advantage, I believe, if these poor cows were eliminated.

9686. You cannot suggest to the Committee how many years it would take to breed a sufficient number of cows giving a higher grade milk to take their place?—According to the plan I have suggested of giving each man a year to turn round in I think it could be done comfortably.

9687. In taking your control samples as between the retailer and between the farmer do you allow anything for depreciation between the two points—the point of production and the point of sale—I mean for the loss of butter fat from various causes, such as the difference in what is called personal equation, for instance, and other things of that kind, or would you like to have a hard-and-fast rule?—I do not think the thing is fastened down to a minute fractional difference.

9688. Would you want it to be approximately the same?—It is only approximately the same. I know there is said to be a certain loss, but the thing would not be judged with that degree of severity.

9689. (*Mr. Cowan.*) You have told us about the control sample system that has been adopted in Manchester for some time. Do you not think it would be an injustice to the producer if you do not have his sample tested immediately after it has been taken at the railway station? According to what you have told us it would require fourteen days before you could get at the farmer, and would that not be an injustice to the producer?—I should hardly think so.

9690. You would understand that the sample that would be taken from his cows a fortnight after the sample was taken by the inspector at the railway station would not be at all the same?—It would not be quite the same. It would not be very materially different probably.

9691. Do you not suppose there might be a difference in the course of a fortnight of from 0·5 per cent. up to 1 per cent. of fat?—In the whole herd.

9692. Yes; 0·5 per cent., at any rate?—Extremely unlikely. One could conceive a condition of things in which that material difference had occurred, but that would be very exceptional—with good feeding, that is; proper feeding.

9693. We will suppose that the inspector took a sample at Manchester the day after the cows had been exposed to a violent hail storm and an exceptional change in the weather, when his milk would certainly be poor that morning?—Yes, that is a possibility that would be taken into account, of course. All administration has to take exceptional incidents of that kind into account.

9694. That would be taken into account?—I think everything that is exceptional would.

9695. You speak of fourteen days. Do you not think it would be very much better to get in contact with the producer the very day following the suspected sample being taken?—The sooner the better, certainly.

9696. Would there be any difficulty in doing it the following day?—Yes, I think there would be some difficulty, but if you took it from the retailer you see you have several steps to go through. If you were to be willing to rely upon that I should think you could follow it up pretty quickly. I should think you might follow it up the next day.

9697. Would it not be better in this sense, too—that with an interval of fourteen days the rogue who really had sent an adulterated milk could so manipulate things that he could nonplus you at the end of the fortnight, and it might be to the disadvantage of the honest man?—But then it is hardly a fortnight, you see, upon the last poor samples, though it is a fortnight upon the original poor sample. Supposing a poor sample is taken at the station, it is only two or three days after that; it is not a fortnight after the last poor sample.

9698. No, it would be a matter of seven days, perhaps?—No, two or three days at the outside; only the time necessary to make the analysis.

9699. It would take you at least three days when you took the first sample from the retailer; then, when you went to the station and took another sample that would be other three days, so that a week, at the very least, must intervene?—The sample taken on the farm controls the sample taken at the station. It does not control the original sample, it is only controlling the last sample taken at the station. There would be all that interval, it is true, between the original sample and the sample taken at the farm, but it would only be an interval of a day or two between the last poor sample taken at the station and the control sample taken at the farm.

9700. You have stated that something of that kind would be a necessary protection to the honest middleman, although it lends itself to the possibility of fraud. In

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what way does it lend itself to the possibility of fraud?—In the way I have mentioned, that, supposing one farmer was sending in a poor quality of milk it is open to the middleman—I do not say he would do so, but it is open to him—to lower the whole quality of the milk coming to him down to that poor farmer's sample.

9701. Do you not think that could be easily got over by the inspector?—How?

9702. Could not the inspector identify the churns in which the sample came? I cannot see that the middleman could reduce all his milk to the value of the sample that was taken for this reason that it would be open to the inspector to see the churns from which he took the sample, and he could certainly identify them; it does not follow that that man's churns would be exactly the same as the churns from the other dairy farmers?—That is true if the churns that are sent out had to have the name of the farmer on them; but they need not.

9703. They must be numbered or something; he could at least identify the churns. I do not think that you need fear that difficulty in the way of fraud; that can be got over surely by the inspector?—It is possible to get over it no doubt, but I should think it exists at present as things are now done. No doubt with a little contrivance it could be got over, I should think.

9704. Is there any other way in which your inspector could be hoodwinked by the dishonest farmer, except by averaging the cows or giving them an extra dose of salts?—I do not know of any. The inspectors are skilled men, and they know how to take milk samples. They see that the cow is stripped to the very uttermost. There is no precaution left untaken to see that the samples are properly and completely drawn from the cow. All that is attended to, and of course they know the wiles and the ways of the country people, and they look into the milk churns to see that there is no water or separated milk.

9705. Do you not think that the dishonest farmer is very apt to be somewhat of a skilled man too?—Yes, and undoubtedly very much so.

9706. In that case could he not hoodwink even the inspector by having his cows improperly milked when the inspector went there?—But the inspector milks the cows himself, and sees that the cows are properly milked.

9707. Is it not the fact that a cow will not allow herself to be so easily milked by a stranger as she will by those she is accustomed to?—Very often that is so, I know; no doubt that is a possibility. I think that is a decided possibility; in spite of the assurance that we get that all these precautions are taken, I think, that is a possibilty.

9708. You speak of a system of educating the farmer up to produce a better class of milk, and you think that would be possible in the course of time?—Of course, fixing the standard would be in itself a method of education.

9709. I understand you to say that the cities might send a veterinary inspector to see that the farmer through better housing of his cows, better feeding, and in other ways could in the course of time produce a better quality of milk?—Yes, I suggest that because the man who does this kind of thing naturally soon gets to have an enormous experience of cows, and the modes of feeding, and so on; he is a skilled man to begin with, and he is devoted entirely and especially to that work. He knows what different people are doing, and he is able to compare one thing with another, and altogether he becomes an expert in that particular line. I think he very soon becomes a man well qualified to give advice of that description.

9710. That would cause a very large amount of expense, would it not?—No doubt it would cause some expense in changing the cow, but not so very much.

9711. I do not mean the farmer, but I mean the Corporation of Manchester or other cities would be put to a great deal of expense?—All these cities are now going in for the control of tuberculosis, and we have a veterinary surgeon, so it would be very little additional expense. I think that the other cities would wish to protect themselves in that way—the larger cities at any rate. Doubtless if generally adopted it would cause additional expense.

9712. Do you not think that instead of taking a sort of fatherly charge of the poor farmer the same object would be attained by first saying, "I refuse to take your milk"—if you will not have it, then he would educate himself, and that is the best kind of education when it is at his own expense?—It is certainly a good education, but it is rather a drastic one sometimes. We propose as far as we can that he should be assisted. I do not insist upon that, of course. Very often the farmer knows all about it; probably in many cases he gets a poor quality of milk, knowing perfectly well what he is about; still you have discharged your part of it if your veterinary surgeon has advised upon the subject.

9713. You say there would not be much difficulty in improving the quality of milk during the summer months by giving the cows artificial food?—By adding to the pasturage what supplementary food was necessary.

9714. Is it your experience that there is sometimes a very great difficulty in getting cows to take artificial food of any description when there is a sufficient amount of pasturage?—That I am not aware of. From all I can make out on the subject it is done, and I do not know of the difficulties which have been encountered—there may be difficulties.

9715. There are very great difficulties indeed. I have a herd just now of upwards of 80 cows on one of my farms, and my dairyman was telling me when I was last at home that since they have gone out on to the pasturage—good, fresh, young pastures—he has had very great difficulty indeed with a number of the cows in getting them to partake of the albuminous food that we would like to give with the grass?—Excuse me, I do not profess to have a very intimate knowledge of this subject; but is not good fresh pasture about as good food as cows can have, and if it is deficient would not the cows be glad to get supplementary food?

9716. I do not know how it is, but it is difficult to get them to take it. You say, of course, that when they go out to the pasture they suffer from diarrhœa at this season of the year; so they do, and that produces certainly a poorer milk, but then the difficulty is to get them to take the albuminous food?—Yes, such as cake.

9717. You have not much experience in connection with what feeding would do on pasturage?—I am not a farmer, nor am I a veterinary surgeon. I am taking a general interest in this matter; but I do not profess to be a great authority upon it. I only express my general views upon it.

9718. (*Dr. Voelcker.*) You regard the supply of milk of good quality as very essential, especially in regard to infant life?—Yes, I do.

9719. Would you regard a milk which gave 2·1 of fat as a proper milk to be sold as nursery milk?—I should not.

9720. What is your experience in Manchester with regard to those special lots of milk which are sold as nursery milk; have you any special experience of them?—No.

9721. Has there never been any regular inspection of these in particular?—I am not aware that such samples are sold. Except occasional specimens that are got from the Aylesbury Company and sent specially, I am not aware that there is any sold as nursery milk in Manchester.

9722. Do you not have milk that is supposed to be from single cows sold largely in Manchester?—I do not think so. We have a Pure Milk Supply Company, which has started in Manchester, which professes to supply absolutely clean milk from cows guaranteed free from tuberculosis—that is a condition. This milk is treated very much as milk is treated in Copenhagen by the Copenhagen Milk Supply Company.

9723. Your attention as the Medical Officer of Health has not been drawn particularly to any special supply of milk for the purposes of infant feeding?—No.

9724. The question does not arise in Manchester?—No, it does not; I know it arises in London.

9725. You told us that the general improvement of the quality of the supply has come about largely through better supervision?—Yes, I think so.

9726. As far as the farmers are concerned you think there is less adulteration now than there was formerly?—Yes, I do on the whole. Of course, the points of weakness which I have mentioned must be taken into account.

9727. You hint in one part of your *précis* that adulteration by the dealers may take place to a considerable extent?—It is open to them to do it.

9728. But in another part I notice you speak of the little control that dealers exercise in regard to the quality of the milk?—Yes, that is very curious.

9729. You rather express your surprise at the small amount of attention they pay to it?—The small amount of attention that they seem to pay to it when one remembers all these defective samples which are absolutely traced to the farmers.

9730. If it is the case that they know so little about the milk that they get is it likely that they would water the milk down to the poorest quality that they receive?—There is no reason why they should not know.

9731. They would require to know before they could buy it?—They would require to know, and perhaps they do know.

9732. According to your experience, what is the form of adulteration that takes place mostly?—The chief is the addition of water.

9733. The addition of water rather than the removal of fat?—Also the removal of fat.

9734. Both forms are prevalent?—Yes, and both together.

9735. Do you experience any difficulty in carrying out prosecutions to a successful end when the public analyst has reported that there has been adulteration?—No; I believe that practically no difficulty has been experienced in Manchester.

9736. Do I take it, however, that prosecutions are not instituted until after the working of the system of control has had its run?—Yes, that is so.

9737. Invariably is that the case?—No, I believe not invariably, but generally.

9738. If the public analyst finds the sample sold by a retail vendor bad is action never taken at once?—If they cannot trace the milk, of course, they would take action on the poor quality.

9739. But they endeavour, in the first place, to follow it through this system that you have described to us?—Yes.

9740. Has the control system had anything to do, do you think, with producing a better kind of milking cow or the better feeding of the cows?—I should think very likely it has.

9741. It probably has?—I should think when a man finds that he has been producing very poor milk it is by no means pleasant to him. He gets found out. It gets talked about by his neighbours and so on, and he does not like it, and he tries to improve.

9742. You told us in the case of samples that were taken at the station of delivery, as supplied by the farmer, that, generally speaking, the farmer gets to know that samples are going to be taken?—No, I did not say that. I said that he might get to know. He might, if he chose, put himself to a considerable amount of trouble to make arrangements, but he does not generally get to know.

9743. In the ordinary course of events, when the inspector has been to the station to take a sample of the milk as it is delivered by the farmer to that station, between that time and the time of the inspector coming to the station to test the milk of the farmer's cows, it would generally get bruited about, and would come to the farmer's knowledge, that the inspector had come to the station and had been taking samples?—I think that is possible.

9744. It is more than possible. Would it not generally be the case?—Not necessarily.

9745. The inspector could not visit the station unknown to anybody?—You see, the farmer would not be likely to get much assistance from the dealers or any of the other people concerned. They naturally want to throw the thing upon him, and I think he would get very little information from that source.

9746. (*Chairman.*) The inspectors would be at one of these Manchester stations nearly every day?—Yes.

9747. (*Dr. Voelcker.*) I am afraid I am mixing up the stations. I was under the impression it was at the farmers' station?—No, it is at the station in Manchester.

9748. Then I am wrong. Can a sample not be taken at the farmers' station?—It is not, as a matter of fact.

9749. Could it not be?—No, I think not.

9750. Is there anything to prevent your inspector going to the station from which the farmer sends his milk and taking a sample there?—I think we have no power of going there.

9751. Because it may be in another district?—Yes; I think we have no power for that reason.

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9752. If the sample be taken at the station of delivery, how does one get to know which cows belonging to the farmer supplied the particular churn or churns?—I have enquired into all these points naturally. The same cows, I understand, are used to produce the same churns of milk, and he knows which cows belong to the particular churns. In order to give him adequate protection samples are taken from all the cows—so many churns, so many samples.

9753. That seems a very weak point in the system of control—that it is left to the farmer practically to say which cows filled which churns?—Of course, he could manipulate it in that way; if he chose to alter the cows going to the particular churn he could do that.

9754. There is no onus on the farmer to put the milk of a particular cow into a particular churn?—Except as a matter of custom.

9755. Then it must be very hard to indicate which cows are to be called in question?—The farmer has sufficient skill to examine the separate milks from his different cows, and knows exactly the milking qualities of each; no doubt he can do with you practically what he likes upon that system.

9756. What is there to prevent a farmer having added water to the milk given by the richer cows, and, when called to book, referring the inspector to the cows that he knew gave poorer milk?—If he knows the qualities of the cows he can manipulate the results, no doubt. I may say, however, that, so far as I can see, there is no reason why you should not mix all the milks together and take an average. It is not necessary to take the separate churns, as far as I can see.

9757. (*Major Craigie.*) You mean an appeal to the herd, not to the cow?—An appeal to the herd, and not to particular churns. That has been done, but I do not think it is necessary to go to such minuteness as that.

9758. (*Dr. Voelcker.*) You hint that the farmer may be educated to know the quality of the milk. I suppose you would not hint, too, that when the inspector comes the cow gets educated to the point of giving 1 per cent. of fat less? We have heard that if the inspector milked the cow he possibly would not get out all the milk, as she would not yield naturally in his hands as much as she would in the hands of her ordinary milker?—That depends upon the skill of the inspector. If he is a very good milker I should think that could be prevented.

9759. Under the system which has been in vogue up to now, anything would pass as long as it came from the cow, and no action would be taken?—At present.

9760. But under the new Act you would draw the line at whatever standard is fixed?—Yes, I would. I would not allow the farmer permanently to go on producing a poor quality of milk.

9761. You think that now the best thing would be that if the control sample taken at the farm from the cows falls materially below the standard you should call in a veterinary surgeon, and give the man twelve months or so in which to improve the quality?—That is my proposal.

9762. Are you aware that the idea under the new Act is to fix that in figures, and that steps to investigate the matter should be taken as soon as those figures are not come up to? You say, "when a sample falls materially below," what do you mean by "falling materially below" a standard?—Clearly below; if it was just on the border of those points, of course not.

9763. Then do you mean to say that if certain figures were fixed as a standard as the outcome of the sittings of this Committee and the Board of Agriculture's decision upon it, you would still have a sort of standard of your own which might not be quite the same as this?—If you got 2·9 of fat, or something of that kind, where there was a possibility of experimental error, you would not, of course, punish a man.

9764. Supposing this Committee were to say that anything below 3·25 marked the presumption that a milk was not genuine, what would you do then?—Probably if I were administering the thing I should do the same thing; I should say 3·15.

9765. Would you take a lower working limit?—I would first make a little balance on the limit that you fix.

9766. (*Major Craigie.*) The standard would not be the standard absolutely?—It would be the standard, but if a standard were fixed I would always allow for a little variation, a little possible error.

9767. (*Dr. Voelcker.*) In other words you would not

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carry out the letter of the law?—Not absolutely; I would allow for a slight experimental error.

9768. If a sample were taken in the first instance by the public analyst, and it showed figures below the standard that is decided upon by the Board of Agriculture there would be no option on the part of the analyst; he would simply give his figures, and report that his sample falls below it?—Yes.

9769. And proceedings would thereupon be taken, or investigation made by the Local Authority?—Do I understand you that the Local Authority are absolutely obliged to take proceedings.

9770. (*Major Craigie.*) No, it is in their discretion?—They would, of course, take proceedings, supposing it was what I call materially below the standard, but if it was first hovering on the border they probably would not.

9771. (*Dr. Voelcker.*) Speaking on behalf of the Local Authority, whatever standard is fixed they would have a working limit, do you say?—I do not know what they would do. That is what I should personally do. I would not allow much latitude, but there should always be a little.

9772. Would you be in favour of some latitude?—Very little.

9773. You say when the milk is below the standard you would call in a veterinary surgeon?—Yes.

9774. I do not wish to say anything disrespectful to them, especially as Sir George Brown is present, but are they always the best men to advise the farmer as to how to feed his cows for milk production?—Yes, if the veterinary surgeon is directing his special attention to this kind of work.

9775. There are some who have paid special attention to it, no doubt?—Yes. If he is a good man, a highly qualified man, and is directing his whole attention to this subject.

9776. If he is a good cattleman you would say?—Yes, and is directing his attention to this point, because everything requires a special education to master it.

9777. Comparing Manchester and Liverpool, which gets the better quality of milk as a general rule?—I do not know.

9778. We have had it in evidence that milk which can be sent to one city cannot be sent to the other. But you do not know about that?—I do not know.

9779. At all events, your supply at Manchester is very much better than that at Edinburgh?—I do not know. Of course, it is very difficult to ascertain these matters.

9780. As medical officer of health, has your attention been directed much to the question of water supply in regard to dairy matters?—Of course, I have had to consider that occasionally.

9781. Have you found many instances of water supply which might injuriously affect the quality of the milk as regards its utility?—Yes, instances are reported to me from time to time.

9782. And that, of course, would be a factor in the case of water being added to milk for the purpose of adulteration?—Undoubtedly, and an important factor.

9783. You mentioned that not many samples of cream were taken. Can you give any reason why the samples were not taken?—I do not know what the samples could be taken for.

9784. Has your public analyst given any reason for it?—No.

9785. You do not think it is possibly because there is no standard for it at present?—Possibly. I really do not know. I should say it is very difficult to fix a standard for cream.

9786. If it was sent to an analyst he would not know what to say?—The only think I can see you would analyse cream for is to see whether starch is mixed with it, or how much formic aldehyde or something of that nature is in it.

9787. It might be half milk; it might be rich or it might be poor?—Yes, it might be. There is thick cream and thin cream, certainly, but I do not see how you can fix a standard for that, because naturally the milks differ in that respect.

9788. Speaking to you now as a medical officer, you are aware, of course, that for the use of infants there is a good deal of cream sold as such?—Yes, I suppose there is.

9789. And that where children have to be brought up by the bottle it is a common thing to use cream as an addition to milk to which water has been added?—Yes, that is so.

9790. And the cream is valuable because of the fat which it contains?—Undoubtedly.

9791. Is it not, then, a very material thing that, as regards the nourishment of infants, what is supposed to be cream should be of high quality?—Where the milk added is bought as cream unquestionably. It then becomes of importance that you should know the quality of the cream. My own impression is that the cream is formed on the milk, generally speaking, in Manchester. That is what I was thinking of more—where the cream is used for that purpose, for addition to children's milk, it certainly does then become important to know the proportion of fat.

9792. (*Chairman.*) Would not the cream betray itself by its thickness in these matters?—Of course, if you added a little starch——

9793. Supposing it is genuine?—Supposing it is genuine the thicker the cream the richer the cream.

9794. Its thickness would tell the anxious parent that he has got what he wants. I am only talking about the percentage of fat?—If it is pure that is sufficient in a rough way.

9795. (*Dr. Voelcker.*) Do you consider it would be sufficient if the analyst certified it was free from additions such as starch and other things used to thicken it or to give it a fictitious appearance?—I think so, and he could easily add "rich" or "poor cream," as the case may be.

9796. If it were free from adulterants of this kind the public might be guided by its appearance?—For some purposes I should think so.

9797. You cannot suggest any standard?—No. I should think the only standard is mentioning the percentage of fat in it. I must say that I do not quite see how you can fix a standard. You see it as containing so much percentage of fat. That is what you want to know?

9798. You cannot suggest to us any figures?—That is not a standard. That is rather naming the percentage of fat, is it not?

9799. You might say that thick cream should not contain less than 50 per cent. of fat?—Yes, you could do that.

9800. Would that be advisable, or do you think there is no necessity for it?—I really cannot see much necessity for it. I do not quite see the point, because beyond those limits it would vary very considerably, and below them it would vary very considerably. It would be much better, I should say, to state the precise percentage of fat, and then you would know what you were buying. I am afraid I do not quite see the point of the question.

9801. Have you had to do with milk preparations at all?—Condensed milk.

9802. I will speak of condensed milk next?—On the American system?—No, I have not.

9803. With regard to condensed milk, you tell us that very few samples have been taken, but must we not conclude when you tell us that a good deal of it is used that a considerable quantity of this condensed milk is used for infant nourishment?—Yes, certainly, a considerable amount of condensed milk is used.

9804. Then, does it not seem a pity that more samples of it are not taken? You tell us that very few samples of it have been analysed?—Yes, that is so. I may point out that the different brands are perfectly well-known. They have been well analysed, and we know the result of analysing the different brands so that as these milks are distinctly marked there is perhaps not the same reason for multiplying samples that there is in the case of individual milks.

9805. You have had, so far, no difficulty in getting 3 per cent. of fat as a standard in milk?—That is the standard.

9806. There has been no practical difficulty in attaining that?—Only with these poor control samples, which are very few in proportion to the total.

9807. But there has been, you say, generally a low quality of milk, and you cannot say that the quality of the milk supplied has been high?—No, I speak of the tendency of the control system as it is worked in Manchester, but as a matter of fact I have a Table showing a large number of milks taken recently for the purposes of this

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Committee to show the sort of milk which is being sent into Manchester. The results are excellent—very high indeed—9 per cent., and 4·5 per cent.; 9·1 and 4·1, and that kind of thing.

9808. If the standard were put above 3 per cent., say 3·25 per cent., do your tables indicate that there would be any practical difficulty in it being reached?—I do not think it is desirable to go so high all at once.

9809. But that is your only reason for not raising it—that you do not think it is desirable to do it all at once?—That is my only reason.

9810. Your figures do not show there would be any difficulty in it being attained?—Not after a time; of course, there is always a little difficulty in advancing. It is necessary to go by steps and not to do everything at once. You would simply be defeating your object by trying too much, I think.

9811. Your statement as to the desirability of a standard of 12 per cent. of total solids, including so much fat, as against separate amounts of fat and solids not fat is put generally rather than as an analyst; or are they the views of your public analyst?—The public analyst I believe agrees with that.

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9812. (*Chairman.*) Will you be good enough to give us the benefit of your advice on the points we have to consider?—I am afraid I shall not be of very much use. So far as my long experience of Committees and Commissions extends, I think they have handed to this Committee about the most impossible piece of work that ever was suggested.

9813. I am sorry that you take that view, but I hope somewhere you may be able to help us to get out of the difficulties that you see overhanging us?—What impresses my mind so strongly is this: I sent some milk to Dr. Voelcker the other day from a perfectly healthy cow, with a perfectly healthy udder, living an open-air life, and kept with five or six others, for the support of the children of the family. The percentage of fat in that milk was something like 2·50. I should say that you could not possibly get a more perfect type of genuine milk than that was, and so far as I am aware there is absolutely no evidence whatever that for food purposes 4 per cent. of fat is better than 3 or 2·50—certainly the excess of fat will not be digested.

9814. Do you think, according to that, the standard we should fix should be 2·5 to catch your cow?—No, unfortunately, because a certain number of animals—Jerseys, for instance—may be considerably over 4, and then the fortunate possessor of that milk might water it down to 2·50.

9815. Who is going to suffer?—I am afraid the consumer would suffer in that way.

9816. You say the consumer cannot digest it?—He would not suffer in his digestion, but he would be paying for poor milk the price of rich milk.

9817. (*Major Craigie.*) He would suffer in his pocket?—Undoubtedly, he would suffer in his pocket.

9818. (*Chairman.*) The producer of the rich milk would benefit?—Unquestionably.

9819. Of course, if a man pays for milk he expects to get it as it comes from the cow, and expects it certainly of a fairly high quality—2·5, we take it, would be rather low, would it not?—Yes, it would.

9820. You would not expect when you bought the milk to get it as low as that in the ordinary market?—No; getting it as low as that, you would conclude that it had been watered.

9821. You think for the purposes of digestion and assimilation—nutrition rather—that milk of 2·5 is as good as milk of 4 per cent.?—So far as I can judge rom all the evidence I have met with it is, and somehing like that proportion of fat exists in human milk, believe.

9822. We are told we are not to judge by an inlividual cow, but it is undoubtedly the fact that cerain individual cows will give poor milk, but the verage quality of milk is very much higher than 2 5?—Yes.

9823. We are trying to fix a standard which would over generally the ordinary, normal condition of the erds of the country?—To fix a standard that would e fair to the seller of really good milk from cows that re well kept and under healthy conditions, I should hink something like 3·50 would be a reasonable standard.

9824. And not likely to inflict any hardship upon any roducer?—It would on the possessor of those animals hich only gave milk yielding 2·50.

9825. Would there be many of them?—It would be erfectly genuine. That is the difficulty. In reading the minute of the appointment I have observed that the Committee are not asked to fix a standard, but to decide what deficiency of the normal constituents, or what addition of extraneous matter may lead to the presumption that the milk is not genuine until the contrary is proved. That occurred to me, particularly when I was reading it over again this morning, to be quite a different thing from being called upon to fix a standard.

9826. (*Major Craigie.*) It is only a presumptive standard—raising the presumption?—Certainly.

9827. The words are not only the words of the reference; but the actual words of the Act, are they not? The reference to the Committee is governed by the terms of the Act of Parliament, and we cannot go beyond that?—No.

9828. (*Chairman.*) If we have to determine what the deficiency in any of the normal constituents of genuine milk or cream appears to be, I suppose that means that we have got to say what normal genuine milk is?—Yes, that seems to me to be the initial difficulty. I should define, as a physiologist, normal milk to be the fluid which is drawn from a perfectly healthy udder of a perfectly healthy cow living under the most favourable sanitary conditions.

9829. That is normal milk?—I should consider that to be ideal milk, whether it contained 2·50 per cent. of fat or 4.

9830. Unfortunately they do not call it normal milk; they call it genuine milk, and we have to find out what its normal constituents are, so that brings us face to face with the point of what are the normal constituents of genuine milk?—Then it seems to me you must decide what are the normal constituents of milk which only yields 2·50 per cent. of fat, and then find out what are the normal constituents of milk which yields 4 per cent. of fat. You cannot possibly establish a standard which will include the two.

9831. In what way would you recommend us to approach this subject?—I do not see what alternative there is to adopting at least two standards certainly, or probably three, to affect animals, according to the circumstances under which they are placed and according to the breeds; because a standard that applies to a Dexter Kerry running out to grass cannot possibly apply to a Jersey or a Guernsey fed in the sheds and kept warm.

9832. You see our difficulties?—Yes.

9833. I am afraid you are not able to help us over the stile?—I am afraid that is really all I can do. I see the difficulty—and I feel utterly helpless to make a suggestion that would in any way relieve you from the difficulty.

9834. But you think if we did start with a standard we should, say, 3·50 of fat?—I think that would take in perhaps the larger proportion of the animals that are kept specially for the sale of milk for the consumer.

9835. You would say that the normal constituents of genuine milk would be 3·50 of fat, and solids not fat, what?—To bring it up to something like 12·50, or approaching that, say 9 of solids not fat, and 3·50 of fat.

9836. That you would consider we should be justified in laying down as the normal constituents of genuine milk?—Yes. I do not think anyone ought to complain of any hardship in that, because there are thousands of cows that would come under that standard quite easily, and those who fall below it must drop out of use; that is all. It is a standard that would not satisfy everybody, that is quite certain; but then, I presume, the Committee does not ever contemplate the idea of doing anything that would satisfy everybody.

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9837. We have to leave that to the Board of Agriculture. So far with the milk. What do you say to a standard for cream?—I have not paid any attention at all to the subject of cream, because it is such a very indefinite article; it is something which they take off the top of the milk after a certain number of hours, and it must vary enormously in character.

9838. Do you think it would be a very sensible thing to do to fix a standard for cream?—No, I do not; even with a separator, it is recognised in the trade that you may have either single or double cream. I saw one mechanic rather boasted of a separator being so capable of regulation that he could get as thin or as thick cream as he liked, so that you might easily from that machine have five or six standards of cream.

9839. It is a question, then, for the individual taste of the customer?—Yes; and it occurs to me that in that direction you might be more arbitrary with regard to cream than you can safely be with regard to the milk which is drawn from the cow, because they can keep the cream up to anything they like without any trouble. If you complain to your dairyman that he is sending you single cream or thin cream, he will say he will send you double cream the next time, so that he could easily make it up to the standard. I do not think you would have so very much difficulty in fixing the standard for cream.

9840. But you do not recommend us to do so?—I do not see any hardship in it. It would interfere, of course, with the sale of the cream which people are satisfied with, and, presumably, which they would get at a lower price.

9841. We are told in some localities there is a very poor thin class of cream sold which is pretty generally used throughout the town by the mechanics who are accustomed to it; they are satisfied, at all events, with the price they pay for it, and they are satisfied with the commodity. It contains a very low percentage of fat, but apparently it suits these people's tastes. You could not fix a standard and say cream is only to be cream when it contains only a higher percentage of fat than that; it would injure that particular trade?—Yes; it would obviously.

9842. Therefore you do not think it is advisable to touch cream at all?—No. I think it is better to leave cream alone. It is a term that has absolutely no definite meaning; it is like "condensed milk," which may be anything that you get into a tin.

9843. Have you anything to say on condensed milk that you think we could do?—I have only examined condensed milk in reference to disease organisms—never with reference to its general constitution. It is generally fairly rich in organisms of different kinds.

9844. You think it would not be right to prescribe some standard for condensed milk, or, at all events, to insist on some statement being attached to the tin?—Certainly; I should insist that a distinct statement should be made of the quantity of sugar which it contains, and reference should be made to any preservatives which might possibly be used for the purpose of making it keep better, so that the purchaser should know what he was taking.

9845. The amount of sugar?—In some specimens I have met with I should judge from the appearance and the taste that it must have something like 75 per cent. of sugar with it.

9846. It was very likely skimmed milk?—It was very like skimmed milk, with a large quantity of treacle added.

9847. If you bought that stuff you would like to know what it consisted of?—Yes; I think that would be the way to deal with condensed milk—to insist upon a distinct statement of its composition.

9848. There ought not to be much difficulty about that?—None whatever; the manufacturers know perfectly well what it contains to a fraction.

9849. And also how much water it requires to be diluted with to bring it back to its original constitution?—Quite so.

9850. As regards skimmed milk, which is mentioned in your *précis*, you think that you can hardly establish any standard for skimmed milk?—No; I do not think it is possible to have any standard for skimmed milk. Of course, the use of a separator has very much altered its composition. It does not do harm, except in the case of children. The fat which is absent in the skimmed milk for adults may easily be supplied from other sources; but it cannot be otherwise than highly injurious to feed children on skimmed milk—infants particularly—especially the milk separated by machinery, which contains, practically, no fat at all, or some fractional percentage.

9851. A trace of fat is left?—Yes.

9852. Should there be no standard to see that this skimmed milk again is not adulterated with water? Should not there be some solids, not fat, mentioned as a standard?—Yes; you might, I think, mention the solids. The proteid compounds in the separated milk should not be much less, I apprehend, than they are in the whole milk—the separator is merely removing the fat.

9853. You would take about 9?—Eight or nine, I should say, would be the reasonable thing for separated milk.

9854. It would only be fair that that standard should be attached to skimmed milk?—Quite so.

9855. (*Major Craigie.*) You have said that the task before this Committee is a difficult one, because of the difference of opinion as to what may be the constituents of genuine milk?—Yes.

9856. You are aware that the statute does not require any regulation to be issued by the Board upon this subject at all?—Yes.

9857. And that this Committee has been appointed to consider, amongst other things, whether any such regulation should, as a matter of public policy, be issued by the Board, and on that point you are rather disposed to give general evidence to the effect that no regulation would be desirable. The Board ask counsel of this Committee, and the Committee ask counsel of you. Is it or is it not desirable to exercise the option which the statute gives to the Department to make any regulation on the subject of the standard at all? It is quite an open matter under Section 4?—If the President of the Board had spoken to me on the subject before he appointed the Committee I should have said, without the slightest hesitation, "You had better leave the thing alone."

9858. It was open, as you observe, to the Board of Agriculture either to make such regulation on its own initiative or to make such inquiry as it pleases, but it was not necessary to make it by committee; although, having decided to make it by committee, the Board naturally direct the committee in the first place to advise them whether a standard fixed by regulation is or is not desirable? That is the primary question before us, is it not? —Yes.

9859. And on that point you have made up your mind? —I should say most distinctly it is not desirable.

9860. No standard is desirable on account of the difficulties that present themselves?—I believe it would lead to a lot of dissatisfaction, and I do not think it would lead to any particular advantage for the consumer.

9861. You have not only had very long experience of this question, but also a very exhaustive experience of dealing administratively with questions concerning a vast number of farmers and producers and consumers in many other capacities?—Yes, I have.

9862. And you are impressed with the friction which might result from the fixing of something more of the nature of a standard than exists at the presnt time?—I am decidedly impressed with that.

9863. You are aware that a standard of a sort, though not fixed by law or by regulation, exists at the present time?—Yes.

9864. That that standard is practically 3 per cent. of fat and 8½ per cent. of solids not fat?—Yes.

9865. You think that the laxity which the optional standard, if I may so call it, that now exists, has produced is not in itself a sufficient evil to lead us to go to the other evil which you suggest of friction on account of a fixed standard?—No; and if I thought it was a sufficient evil I should still think that you could not prevent it, because there can be no difficulty in going on with the adulteration of milk in such a way that it could not be very easily detected. After watering it you can easily add to the quantity of fat artificially, either before it is drawn from the udder or afterwards; it would not make any difference. It is as easy to do one as the other, and it is very difficult to detect. Recently I have been trying some experiments to ascertain if it were possible by the aid of the microscope to find out when fat had been added. I have tried several oils. I tried rape oil in the last instance, because I heard a very large cowkeeper, talking

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to a friend a little while ago, make the remark, "You can take off all the cream you want, and then, of course, you would go to your rape oil." I thought I had not heard of rape oil in that particular connection before, and I got rape oil. I took a large quantity to begin with, but that was so hopelessly and obviously apparent under the microscope that it was not worth going on. Then I put one drop in about two drachms and examined it, and I found that there was no difficulty at all in detecting the adulteration. That is a photograph of an excellent specimen of genuine milk (*handing in same*). This is the same milk to which one drop of oil had been added to the quantity I mentioned (*handing in another photograph*). You will recognise at once that the natural milk globules are all pushed up in a heap by the new oily material, and there are great masses of fat, not only in the form of globules, but here is one large band which sweeps across the field of the microscope.

9866. How is that oil added? At what stage?—That is milk I took from my own table, and is probably twelve hours old. My point is that those two photographs are photographs of the same specimen. I do not often find one so good as that on my own table; I commonly find those "blobs," as I call them, of fat in the milk, and I notice if I keep the milk in a test tube for twelve hours that I get an abnormal quantity of cream, or something that looks like cream—something like 50 per cent. occasionally. I have not the faintest doubt in my own mind that means added fat.

9867. There are oils and other fats that may be added in the same way as rape oil?—Olive oil does better than anything else—the best salad oil. Probably the others are used because they are cheaper—sesame oil and rape oil, and some of those which are tolerably flavourless. They have no odour and do not throw up the oil in hot water, so that you may pour it into your tea without being at all disturbed by the appearance of the top of it.

9868. (*Chairman.*) You could not make cream with rape oil?—It makes something that looks very much like cream abundantly; but the microscope is no use with that, because cream naturally has those large masses of fat scattered over the field.

9869. (*Major Craigie.*) Therefore this might be added to thin cream to make it thick cream that we were talking about just now, as well as being added to milk to give it a richer appearance?—Yes, undoubtedly, and I have no doubt it is added.

9870. (*Chairman.*) Without any chance of detection?—Unless this is the right way of detecting it I do not know. Of course, Dr. Voelcker would be more capable of giving an opinion than I am as to whether he could detect the fat analytically. I do not know how it could be done.

9871. (*Major Craigie.*) In pursuing this question, your objection to a standard depends very largely upon the great facilities there are for manufacturing milk of any standard that might be desired?—That is one strong reason for objection. You induce people to try to circumvent the regulation the moment you endeavour to enforce it.

9872. In fact, speaking generally on the subject of milk, you suggest that cow's milk was not intended by nature primarily as food for man at all?—Yes.

9873. It is an adaptation of a product which was meant for another purpose?—Quite so.

9874. To use milk as we use it now is in itself a step which is not a natural process?—Distinctly, and the milk itself is not a natural product now; it is a product of civilisation—of centuries, or generations at any rate, of artificial selection. It is not natural for a cow to give 12 or 16 quarts of milk per day. It was only intended to give enough to feed the calf.

9875. Would you go so far as to say, when the question of normality comes in, would a normal milk mean a milk from the cow in the state of nature?—Yes, absolutely.

9876. And not from a cow as developed after centuries of breeding and after scientific feeding and treatment?—That must necessarily disturb the genuine character of all milk to some extent. It may not do it in a prejudicial manner.

9877. Have you any general impression as to whether the milk supply of the country, from such observations as have come before you, has improved or decreased in character in the last ten or fifteen years? I do not mean in quantity, I mean in quality?—I do not think I could give any opinion on that subject.

9878. We had evidence given before this Committee only yesterday rather suggesting that the greater demand for milk as milk has led the producer to go in for quantity at the expense of quality, and that the tendency of modern milk producers is to produce a poorer milk in greater abundance. But you have no evidence on that point?—No. I rather doubt it, because if I look back to Dr. Voelcker's analyses of 1850 and 1852—I do not speak of the present Dr. Voelcker, but of his father—and compare them with modern analyses I do not think I should find anything like that.

9879. Do you think that by looking at some of those records we could get an answer to that allegation of the growing poverty of the milk?—I should think so. It seems to me a question that might be easily settled by a reference to the analyses made by chemists even fifty years ago.

9880. It struck some of us here as rather a curious statement—and it was novel to myself at all events—that the quality of the milk of this country had gradually decreased?—I take that to mean that the quantity of proteid solids and fats has decreased as compared with the quantity of water; and that, of course, is a matter which could be settled by a reference to different analyses without any difficulty.

9881. Have you any very strong opinions as to the effect of feeding upon the milk itself?—I think that the whole of the evidence all over the civilised world goes to show that it has practically little or no effect. Beyond a certain normal state of fat it is almost impossible to increase it by any manner of feeding. The most successful experiments that I have heard of were performed, I think, in Germany, where animals were fed on the ordinary feed-chaffed hay, oilcake, and so forth, but the whole of the water which they drank was mixed with an emulsion of sesame oil, linseed oil, and the stearine of tallow. It was said that that increased the amount of fat to 5·50 per cent., but they do not state in the record what the normal amount of fat was before the experiments began, but presumably it was considerably lower. It is mentioned as almost the only successful experiment in producing an increase of fat by feeding on fattening material. There are plenty of experiments, I may say, in which it is proved quite clearly that giving animals large quantities of oil mixed with the food reduces the quantity of fat. It disturbed the digestion of the animal; it would make a human being sick in all probability, and it makes the cattle feel sensations as much as cattle are capable of.

9882. It disturbs the animal's condition?—Yes.

9883. So that you are not disposed to believe in the suggestion that milk is poorer than it was, or that it could be made very materially richer by a system of feeding?—No, I am not; I should say distinctly the contrary.

9884. On the other hand, from these experiments you have just explained to us, it appears that there are mechanical methods of treating milk after it has been produced from the cow or even in the cow itself, which would tend to disturb any standards that might be used?—Yes, there are. Only quite lately I performed an experiment which I believe was performed at a recent agricultural show. The man who got the prize had milk which Dr. Voelcker himself contended was not milk at all. It contained an enormous quantity of solids, and a very large proportion of fat. I got my assistant to get some from the cow. The man was there with it constantly. I examined it under the microscope, and this—(*referring to the second photograph handed in*)—is an exact representation of what I saw. It was not taken from that specimen, but it as closely resembles it as it is possible for two specimens to do. They said it was impossible to add the cream in that case, as the animals were seen to be milked by the judges. It occurred to me that there would be no difficulty whatever in injecting extra fat into the quarter, or no further difficulty than there is in using a syphon for the ordinary purposes of milking the animal. Accordingly I did it. I injected in one quarter of a cow belonging to a friend, who is fond of scientific inquiries, four ounces of cream; into another four ounces of warm water and I left the others alone. I sent Dr. Voelcker the milk from one normal quarter from the cream quarter, and from the warm water quarter, of course, telling him nothing about it, and merely asking him to find out the proportion of fat. The proportion from the ordinary quarter was 2·70, the cream quarter afforded about 4·50 I think, and the

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warm water quarter was very little altered. It was Dr. Voelcker's suggestion, when I told him what I had done, that the chances are that the water was rapidly absorbed as soon as it was put in. Still, I do not hesitate to say that I would undertake to put thirty per cent. of water into the milk by injecting it immediately before the animal was milked; and then the owner might tell the inspector that he was prepared to swear that the milk was drawn from the cow's udder, just as it stood, and that it was sold and sent to him without alteration whatever.

9885. (*Major Craigie.*) That would introduce an element of difficulty in any reference direct to the cow —that the cow itself might be tampered with in the way you suggest?—Undoubtedly.

9886. (*Chairman.*) Would it not require a very skilled person to make the injection?—The syphon was passed in by my friend and the injection was done by one of the farm men, the instrument being left for the use of the farm attendant—the bailiff—in case of any symptoms of dropping after calving, as it is called, occurring. It is the same instrument that they use for injecting iodide of potassium. It is passed up with the most perfect ease, as readily as I could put that pencil between my fingers. An India rubber pump, which is an ordinary injecting apparatus, is simply squeezed while the other end is in the milk. The thing is done without any trouble, and it requires no skill whatever.

9887. No skill is required?—No and no harm is done to anything. The cow stands quite quiet. In my case it was merely adding cream to the milk in the udder, and nobody could complain of that, but I had some little hesitation in making the matter public, because it opens a very wide subject.

9888. (*Major Craigie.*) We have had it in evidence here very frequently that the greater part of the fraud that now occurs in the sale of milk in large towns is committed by the addition of separated milk to whole milk?—I should think it is almost a matter of certainty that it would be so.

9889. That, no doubt, would be a form of adulteration which has increased considerably with the use of separators within recent years?—I should think it is almost certain that it has.

9890. Have you had suggested to you at all any method by which this separated milk could be readily detected in the combined product?—I should judge that the result ought to be a large increase in the solids not fat. If, instead of adding water, you add milk containing a normal proportion of proteids and other solids, say, 8 or 9 per cent., including salts and sugar, that ought to appear in the analysis.

9891. You have not had the suggestion specially brought, perhaps, to your notice that something might be added to the separated milk which would at once reveal its presence, some chemical substance, innocuous to the public health, might be added to the separated milk in the same way that, under the new German law, sesame oil is added to all the margarine made in Germany for the purpose of detection?—I should have a strong objection to legalise the addition of any chemical agent in milk under any circumstance.

9892. You would not legalise the addition of any substance, such as borax or boracic acid?—No. I have no doubt it can be perfectly easily done; there are plenty of things that could be detected without any difficulty.

9893. But you think the difficulties of dealing with cases of separated milk are not sufficiently serious to recommend such a course?—I cannot see except in lessening the quantity of fat, that it would do any harm at all. I should think for the food of the adult it would be considerably more nutritive for it than it would be if they added water instead of separated milk.

9894. Just one other question before leaving the subject. In the general statement you made after stating your full advice on the subject that no standard would be better than any standard, I rather understood you to say to his lordship that if we had a standard more than one grade ought to be adopted, as suited to different types of cows; would you, therefore, go so far as to suggest that there should be more than one grade of milk sold—that milk should be divided into more than one class—prime milk and other milk, for instance?—No; I suggested that that would be an alternative method, but I did not advocate it. I believe my last proposition was that the standard should be something like 12·50 of total solids, of which some 3·50 per cent. should be fats—that is, if you fix a standard at all.

9895. You would not have two standards for different types of milk?—The result of that would be that a certain number of cows would drop out of the dairy trade altogether; but the number would not be very excessive. It would not be an unreasonable demand that milk should contain something like 12 per cent. of total solids.

9896. You did not hear this morning the evidence we heard from Edinburgh, that in that particular city it was impossible to produce milk running up to a standard of more than 2·75 of fat on the ground that the mode of feeding there on brewers' grains, distillery dreg, and other substances, which tended to increase the quantity and not quality, was such an established custom that it could not well be altered; your standard would at once shut out milk of that class, would it not?—I should think that would be a manifest advantage to all the babies in Scotland. It has been shown that the use of grain-fed milk has been injurious to infants in many parts of the world.

9897. (*Dr. Voelcker.*) You told us that in your opinion it does not matter very much to the consumers' digestion whether he gets milk with 4 per cent. of fat or 2½ per cent.?—No. I should think, as a rule, for most people it would be very much better that he should have the 2½ per cent. In my own case, certainly the lower the fat standard the better I should like the milk. I fall back upon the general conviction that it is not material for healthy men at all to take, and the less one has of it the better.

9898. How much lower may we put this down. If 2½, why not 1½?—I should prefer 1½ myself.

9899. Then at what point do we come to it that skimmed milk is obviously starvation diet; where would you draw the line?—I say that separated milk, taken simply by itself, is starvation diet, if you live on it. Clearly you must have for purposes of respiration a considerable quantity of fat in your food to make it complete.

9900. If used by itself as food you would regard it as a starvation diet?—Yes.

9901. You regard the present production of milk by a milking herd as being something abnormal and not intended by nature?—I never use the words "intended by nature," because I do not in the least know what nature is, or whether nature is an intelligent person or not. My impression is that cows have been used for supplying food for human beings as an expedient of civilisation. The first man who tasted the fluid from a cow's udder must have been a hero, a man of transcendent courage; but, finding it was good for food, he immediately adopted the use of it, and in the course of time his example was followed, and now it has become a staple article, and it is a matter of trade to encourage the animal to produce as much as possible.

9902. (*Chairman.*) You would class him with the man who first tried an oyster?—I should think so.

9903. (*Dr. Voelcker.*) Would you regard skimmed milk as starvation diet because of the fact that it has been deprived of its fat?—That is to say, limiting a person to skimmed milk?

9904. The cow, as we have it now, is the product of civilisation?—Distinctly; all domestic animals are.

9905. We cannot call an infant exactly a product of civilisation; but still the present common system of nourishing infants may also be called a product of civilisation, may it not?—Most emphatically. One could say a great deal on that subject that had better be left unsaid, perhaps.

9906. Then will it not follow that if we were to adopt any such view as you put forward the infants might be fed on starvation diet?—No; I should not advocate the use of milk containing no fat for infants.

9907. Infants may be fed on milk alone?—Yes.

9908. If it is not material, in your opinion, whether milk is to have 4 per cent. of fat or 2·5 of fat, or even as low as 1·5 of fat—surely it matters very much to infants, does it not?—I notice in the work of Dr. Cheadle (who is a great authority on the artificial feeding of infants) that human milk contains 2·41 on an average of fat, and that artificial human milk is brought down to that standard.

9909. It is the common practice to take that; but if you buy your milk you may dilute it with an equal quantity of water, and have your 2 per cent. Why should you pay for the 2 per cent. as much as you do for the 4 per cent.?—The addition of water, especially the water of civilisation, altogether modifies the natural milk. It introduces a new disturbing element. The milk of the mother is the proper food for the infant; the nearest approach to that, I suppose, is the cow's milk; that is regulated as to its composition so as to approach as nearly as possible the composition of human milk.

9910. Is not the dilution of cow's milk with about an equal portion of water done for the purpose of bringing the albuminous constituents of the milk down to the same amount as in human milk?—Yes; but you will introduce the various components of water, which are certainly not wanted.

9911. Does not that have the effect also of bringing the fat of good milk down to about the same?—Yes, by adding water you can reduce the fat, of course.

9912. Is it not the common practice, and one recommended by authorities on infant nourishment, to add cream for the purpose of increasing the amount of fat?—I was not aware of that. I do not know why it should be; but, of course, I am not an authority on feeding infants. I am only contending that the proportion of fat in human milk is about the lowest proportion that you will find in perfectly healthy, naturally living cows.

9913. Still, if we meet with circumstances where cow's milk is largely the sole food for infants, and that fat is a material which is necessary for healthy development, surely it becomes a matter of great concern to the public that, for the sake of infants alone, milk should be sold of a quality containing a good percentage of fat?—I do not see why it should be sold as containing a larger percentage of fat than human milk would possess naturally, unless you lay it down as a law that you must add water to it before you give it to the infant.

9914. Taking our cows as we have them, and regarding them as the products of civilisation, at all events the cow in the ordinary way will produce milk of a quality that ranges somewhere between 3 and 4 per cent. of fat, we will say; that being the case at present, is there any reason why, as consumers, we should be content with less than that?—No. I do not think there is, if you could get it.

9915. So far you would agree?—Yes; if you could safely add pure water to reduce it for infants to the proper standard; there is no reason why you should not get 3 or 4 per cent.

9916. That the purchaser can do, and does not want done for him beforehand?—That is so.

9917. That leads me to ask you, do you not regard the addition of water to a rich milk—such an addition occurring at a farm or at some such place where the water supply may not be of the best—as introducing an element of danger?—Undoubtedly.

9918. Would you not be inclined to agree that the fact that a certain standard has existed (whether it was 3 per cent. or 2·75 per cent. of fat), and the fact that the system of having public analysts throughout the country has done a great deal of good in preventing the adulteration of milk by the addition of water or the removal of fat by persons who had no business to do it, have been of advantage?—Yes it has.

9919. Do you not think further that the work of the public analyst in detecting the existence of milk which, from reasons of the unhealthiness of cows, has been abnormal, has been of advantage too?—Undoubtedly.

9920. You know, as a matter of fact, that if the cow is in an unhealthy state it may yield milk of abnormal quality?—Yes, without any question at all.

9921. Taking these points into consideration, are you inclined now to put such a little value upon the question of whether milk should have $3\frac{1}{2}$ per cent. of fat or $1\frac{1}{2}$?—I did not say $1\frac{1}{2}$, I said 2·70. In reference to the digestion of the adult, I say that it is quite as good or better for him that he should have milk at $2\frac{1}{2}$ per cent., as that he should have it at $4\frac{1}{2}$ per cent.—as a rule.

9922. You regard with great apprehension the use of milk from cows which are diseased in any way?—Certainly.

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9923. Especially with regard to tuberculosis?—Certainly.

9924. Do you consider with regard to hand-skimmed milk and separated milk that there ought to be any distinction drawn?—The difference in the amount of fat is, of course, very considerable.

9925. But with regard to their use and the sale of them, ought they to be classed separately and sold separately and declaration made as to what they are?—Undoubtedly, they should, because hand-skimmed milk sometimes, indeed commonly I suppose, contains a reasonable quantity of fat, whereas the other is practically deprived of it.

9926. Skimmed milk or separated milk is largely used for calves is it not?—Yes.

9927. But it is also recognised that it cannot be used by itself?—Exactly; it is always mixed with other foods, of course.

9928. And there are different ways of adding fats to it?—Quite so.

9929. No doubt the practice of adding fats or oils has induced the attempt to imitate the composition of milk in this way?—Yes.

9930. If that could be done, it would be a benefit to the calves, would it not?—Undoubtedly.

9931. You speak of the effect of organisms upon milk, and you mention that normal milk is always more or less contaminated with septic and other organisms which cannot be excluded by any ordinary process; have you had any experience with the souring of milk; I take it you have?—Yes, but I have not worked particularly on that, except in regard to separated and hand-skimmed milk. It was asserted broadly that separated milk became bad so much more quickly than the other, and we tried the experiment on several occasions, and found that the separated milk had the advantage by a long way.

9932. Could you give us anything from your own experiments, or express any opinion on the point as to whether, when milk turns sour that souring is of one kind, or whether many different fermentations take place?—There must be several fermentations and different sourings of milk.

9933. Would the fact of a sample of milk being drawn from a cow—unless, as you described it, the most rigid precautions were taken—in your opinion result in one fermentation taking place or a number of different ones?—I should say no doubt there is a number because there must be one that is going on in the udder. The milk that is drawn is slightly acid, as you know, in the majority of cases—it is seldom neutral.

9934. The prominent change is the lactic fermentation, is it not?—Yes.

9935. That is generally called the souring of the milk?—Yes, that is the ordinary one.

9936. Do you think it would be possible to exclude, in the way that samples of milk are usually drawn, fermentations arising from the presence of numerous other organisms which occur in cow sheds, which hang about the udders of cows, and which come from the hands of the milkers?—I think it is possible, but I am not prepared to suggest the means of doing it, because I find that the preservatives in common use favour the growth of organisms enormously—a large proportion even of boracic acid leads to the development of an enormous number of colonies of different organisms more rapidly, and in larger numbers than occurs in ordinary milk standing side by side.

9937. Do you think that on a sample of milk being taken in the ordinary course where milk is in transit, and if it is put in a bottle and sealed up in that bottle, fermentation will proceed in one regular and definite way and no other?—No, I have not the slightest doubt it will proceed in a variety of ways according to the organisms taken up at the moment.

9938. Do you think it necessary to make any restriction as to the cooking or heating to which milk may be subjected before it comes into commerce?—I am afraid that there is nothing much to be said in favour of heating milk above a temperature of 90 degrees Fahr. for instance—about the temperature at which the calf would take it, excepting that by heating it to a high temperature you kill certain obnoxious germs like

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tubercle. But I am told on much higher authorities than mine in the matter, that this milk that has been heated to the boiling point or near it, is injurious to children frequently.

9939. Because probably of some changes in the nitrogenous constituents ?—Yes, some unrecognised changes which take place.

9940. You told us the result of some interesting experiments which you conducted—do you know whether the giving of the oil to cows is followed by scouring ?—Yes, very often.

9941. Was it in your cows ?—No. I only injected it into the udder.

9942. But it is well known that one of the difficulties of using oil in conjunction with separated milk is that scouring ensues ?—Yes, it is so.

9943. You say, too, that that result would very likely occur with human beings ?—No doubt.

9944. You have told us about the circumstances which led up to your making this experiment; I think you did say actually that when a milk was first submitted to me on a certain Show ground my report was to the effect that it was not normal milk ?—Yes, I remember that.

9745. I believe I said that it ought not to be called milk ?—Yes.

9746. That led you to experiment further ?—That was so.

9947. And the result of your experiment was to show that tests—and perhaps particularly Showyard tests—might be rendered altogether futile, because it was possible to inject the fat which might come out afterwards in the milk ?—Yes.

9948. And which would not by its appearance be detected ?—No.

9949. I think it, however, right to mention what you did not ask me for when sending me the samples, that the quality of these milks as judged by the ordinary standards was altogether abnormal ?—Yes, it was.

9950. You asked me to determine the fat, and the fat showed what you pointed out, but, at the same time, it may be some comfort to the public at least to know that the results obtained by fuller analyses of these milks would have indicated to an analyst that the results were abnormal, and would have directed his attention to it at once ?—Yes, of course, the real difficulty is that you may go on adding fat for a long period, and nobody suspects. They are satisfied that they are getting a large quantity of rich milk, and do not trouble to enquire how it was made rich. It is certainly very curious that the addition of a little cream should have the same effect as the addition of a little oil. I can take the cream from the same specimen of milk, and if I add a little of the same cream back again I get a result like that (*Pointing to the second photograph.*) Having once left its mixture with the milk it does not seem inclined to join partnership again.

9951. Your results were very valuable, as showing that a certain quality of milk, or that certain requirements in the way of fat could be perfectly well met by the injection of fat into the udder ?—No doubt about that; that is proved beyond question.

9952. (*Mr. Cowan.*) You said at the beginning that if the President of the Board of Agriculture had consulted you on this question of milk standards you would have advised him to have left it altogether alone ?—Yes, I would on account of the difficulties which will arise, and the dissatisfaction. Farmers fancy they have had enough legislation, and I am strongly inclined to agree with them.

9953. Are you aware that there is almost no other matter connected with agriculture so far as the farmers in Scotland are concerned, that Mr. Long has undertaken, that has given more satisfaction than his action in connection with these milk standards ?—No, and I am extremely surprised to hear that it is so. If that same observation were to apply to English farmers and the Irish farmers, I should say distinctly it is not so.

9954. I am only speaking for a portion—perhaps a very small portion—of the British Islands, but I know that that is so; not only amongst the farmers, but amongst the great consuming public in some of our large cities ?—Yes, the public, of course, would get the idea that they would be benefited by it, but I should have thought that the farmers throughout the country would rather not be interfered with in that way.

9955. That is really not the case in our part of the country. Do I understand that you are against having any standard at all ?—If it were possible to fix a standard that would meet every case I should say directly let us have it fixed at once; but the difficulty that I mentioned is that you could not possibly satisfy everybody, and you must, by whatever standard you fix, inflict a certain amount of hardship in the case of perfectly genuine milk.

9956. If you carry that out logically there is no law that ever was made in this world that would satisfy everybody, and yet we have to have laws made for the protection of the weak ?—Yes, but this does not seem to me to take that shape at all. It is a question in ordinary law that you start with the assumption that some men must do wrong—that is inevitable—and others will do better. But here is a case where the cow does no wrong; she gives 2·5 per cent. of cream. It is no wrong at all. It is her nature to do it, and she cannot help it. Another one that gives 4 per cent. may have the advantage, but it seems rather hard that that cow should have the full benefit while the other is condemned for being incapable.

9957. I see you have stated that in your opinion a milk containing 2·5 of fat is quite as good for man as a milk containing 4 per cent. ?—Yes, for the purposes of nutrition—for the adult, I am speaking.

9958. If that is so I do not see why after all you advise us to fix a standard of 3·5 per cent. for fat and 9 per cent. for solids not fat ?—On the assumption that you decide to fix a standard I say that 3·5 per cent. would not be an unreasonable demand to make.

9959. Still, if you think 2·5 is as good I do not see why you can consistently advocate 3·50. I hope the great majority do not accept your view that 2·50 is as good as 3·50 ?—I am assuming that other people do not think the 2·50 is as good as 4, and that those who buy prefer 4.

9960. What is the use of upsetting the present arrangements that are going on because we have evidence before us to show that to fix a standard of something like 3·50 the possibility is that about 99 per cent. of the cows of the present generation would have to go out, and we should just have the old original cow to begin with ?—That only strengthens my suggestion that you had much better leave the matter alone.

9961. Yes, but after advising us to leave it alone, I do not see how consistently you can advise a standard of 3·50 ?—I do not advise a standard at all, but I say if you fix a standard I think 3·50 would be a reasonable one.

9962. Being against the fixing of a standard at all, I am surprised that you have fixed on a 3·50 standard, which is quite the highest standard that has been suggested to us in all the evidence that has been taken before the Committee. Do you think that there is a good deal of adulteration in milk at the present time ?—Yes, there is no doubt about it.

9963. Then who suffers by that adulteration ?—The consumer does, of course.

9964. He is least able to protect himself ?—I suppose so, in a sentimental way. The majority of the adulterations—the addition of water and artificial fats—do not do any harm.

9965. But in a sense he is paying money for water ?—I object to adulteration on sentimental grounds. A man ought to know what he is buying.

9966. If you are against adulteration, and if there is adulteration just now, do you think if there is a fair standard fixed it would prevent a great deal of adulteration ?—I rather doubt it. I think it would lead to a great deal more in other directions.

9967. In what forms ?—In the way of reaching the standard by adding fat or lowering it by adding water.

9968. It would perhaps be a long time before the ideas you have put before us of adding fat to the cow's milk before it is produced could be generally known and accepted ?—The idea was put into my head—it did not originate there—by the cowkeeper. I should never have thought of it if I had not heard what someone said quite lately about falling back upon the oil, and had it not been for what this man evidently did in the specimen of milk which had this abnormal quantity and got the first prize.

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9969. Then, at any rate, you think that if a standard is to be suggested there would be really no difficulty over the three kingdoms of reaching the limit that you have put to-day—namely, 9 per cent. of solids not fat and 3·5 per cent. of fat?—I do not say there would be no difficulty because I am satisfied there would be a great deal of difficulty. I mentioned 3·5 per cent. of fat and 9 per cent. of solids not fat as his Lordship asked me what I would suggest if the Committee decided that a standard was necessary. Of course, a practical man's opinion on the subject—a dairyman's opinion—would have much more influence than mine on such a matter as that. If you can fix a standard that will satisfy everybody it will satisfy me.

FIFTEENTH DAY.

Friday, 11*th May*, 1900.

PRESENT :

Lord Wenlock, G.C.S.I., G.C.I.E. (*Chairman*).

Mr. George Barham.
Mr. George Cowan.
Major Patrick George Craigie.
Mr. S. W. Farmer.
Mr. Shirley F. Murphy.
Professor T. E. Thorpe, F.R.S.
Dr. J. Augustus Voelcker.

Mr. R. Henry Rew, *Secretary*.

Mr. N. Story-Maskelyne, F.R.S., called and Examined.

Mr. N. S. Maskelyne.
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9970. (*Chairman.*) The questions that we have to consider, I believe, have engaged your attention for some time?—Yes, they have.

9971. And you are prepared to give us the results of your experience over some years?—I am afraid my experience is not equal to that of a good many gentlemen who have been before you; but such as it is I am very happy to give it to you.

9972. You, first of all, tell us, I believe, that you have your own ideas as to what the intention as to standards of milk is?—Yes; certainly, I have a very decided opinion on that matter. In the first place, I feel the immense difficulty of settling a standard for milk. It is not like fertilisers or feeding-stuffs, where, of course, the purveyor has got to give a guarantee of what he is going to supply, and where the person who buys buys in bulk and occasionally, and can say whether he will take it or not. In milk you cannot do that. The milk is purveyed in small quantities to many customers, and while every farmers milk is slightly different in composition from another farmer's milk, you cannot lay down a single standard which you shall say every farmer's milk shall correspond to. If you put too low a standard you are then levelling down the milk all over the country to a point which will be not only very much to the disadvantage of the public, but such that the only persons who will reap the advantage of it will be the middlemen. The poor farmer himself will be driven down to get the lowest product, and practically, from my point of view, you will be giving the greatest blow to agriculture that you could. Therefore, I say you ought not to have a low standard. On the other hand, you should not have too high a standard, because otherwise you will cut a large number of farmers adrift; they will be unable to rise to that standard, and we shall be doing them an injustice. Therefore I think what one has to do in the first place is to find some standard that shall be reasonable. I do not mean to say it is to be the standard at which you shall say that 20 per cent. of the milk may be below it, or that no milk shall be below it; but you want to have a standard such that any farmer who can afford it, that is to say, who gets sufficient value for his milk, can rise to, and at the same time a standard which, if he is below it, his milk will go into the market with a lower value attaching to it. Now, I know there is a certain amount of milk that goes into the market perfectly genuine, and pure milk that may not reach even so high as what I consider the low standard of the analysts, namely, 3 per cent. of butter fat and 8½ of other solids. I think there is a great deal of milk that will not reach that standard; but, then, that is really either because the farmer himself has not enterprise or has not means, or is so ground down by the sweating process of the middleman that he really cannot produce the article that his cows ought to be able to produce. I know perfectly well at this moment that a decent farmer—a farmer who has got a fairly good stock of cows, and keeps them fairly well—can give you that standard which I have mentioned in my note; a standard, that is to say, of 3·25 of butter fat and 8·75 of other solids; or, as I have put it here, 12 per cent. of total solids, of which 3¼ shall be fat. I am quite sure if you put that as your standard you will find at first a great many farmers will be below it. But I am perfectly certain that in the course of a very short time very few farmers indeed will be below it; and I believe that finally if you find that there are still some farmers below it, it will be either because of the inferiority of their land or of their cows or of their treatment. Therefore I say, my opinion is very strong that you ought not to put your standard too low. You ought to keep it up to such a point, not too high, but to such a point that the farmer can fairly be expected to reach it, if not at once, at any rate in a short time. There is a gentleman at this table who knows a great deal more about it than I can know; but everybody knows that a really good farmer, a man who farms on a large scale, who is sufficiently independent to be able to hold his own against the emissary of the London purveyor, can get a better price for his milk; and not only get a better price for it, but that he, in fact, supplies an article very much indeed above the point which I have mentioned. In very many cases, over a great part of the year he will have his milk up to 4 per cent. of butter fat, and in some parts of the year no doubt down to 3·7; but I do not believe farmers of that kind will reach so low a point as even 3·5 for a great part of the year, and indeed probably all the year round they will be above it. I shall give you a few personal observations by and bye, by way of evidence upon that point. The fact is, that it is to the great interest of the middleman whom I want to eliminate altogether from the discussion, if I can, to keep things as they are. At present, everything is going into the pocket of the middleman, and the middleman grinds down the farmer, and he tyrannises over him in respect of his weights and standard of weight and standard of bulk. In the case, for instance, of his treatment of the farmer in respect of churns that is so; and then again the poor fellow, who clears perhaps a bare five-pence per Imperial gallon for his milk, is told that the purveyor does not want any more of it, and suddenly he is stopped, and perhaps for a month or six weeks he is thrown on his back. I know that I myself have come to the rescue of some of these unhappy farmers. They send me their milk because they cannot do anything with it. They have lost the art of making cheese, and they make such butter that they cannot sell it in the market readily, and the consequence is that the farmer is entirely destroyed, or nearly destroyed, by the action of the middleman: and inasmuch as the middleman gets plenty of very good milk, and can tone down that milk to whatever level he pleases, say to 2·8 or 2·9, he can always tone down the good milk thereto, and

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he can always make a very good profit out of it. Equally, of course, he can tone up the milk that is below any standard that you please, and can supply to the public in any strength, or in any quality that he chooses. There is no doubt about that. Anyhow, the middleman is a very astute person, who knows his business extremely well. He can separate his milk and adjust the proportions to whatever figure you please to designate shall be a final standard. The farmer cannot do that at present, and, therefore, I say that as our duty is to consider the public, and to see how far the public is to really get an honest, rich good milk for the money that they pay, and that inasmuch as the middleman is simply a man who will level up or down the stuff he gets to any standard you please, the real question is as between the consumer and the ultimate purveyor, the ultimate manufacturer, the farmer. Then, of course, comes in the question that I began with, namely, what is the standard of fair, honest milk which you can say that the farmer who is now producing milk can reach. You have to settle what that standard is to be. I have thought this matter over a great deal, and discussed it with a great many people, and I have come to the conclusion for such a standard as I have mentioned just now, 3·25 of butter fat and 8·75 of other solids, or preferably say 12 per cent. of solids with 3·25 of fat is a reasonable and fair standard to assert. You see the fourth section of the Act is practically a saving clause. If there is any good case that comes before a magistrate where you have got a statement from your county analyst that the particular sample of milk is so much below 3·25 of butter fat, when the case comes before the magistrates they can deal with it. I can tell you from my experience of the magistrates that they are very likely to deal extremely favourably towards farmers. The farmer has no cause of anxiety if he can prove that his milk is really thoroughly genuine, and that it has not been tampered with. It is difficult to prove, but I think the *onus probandi* is on the man who produces milk of a lower standard. But I am satisfied that if he produces genuine milk below such a standard there will never be any injustice done, provided the farmer really shows that he has got the capacity, that he has got the herd, and that he takes the requisite precautions for producing a milk which will honestly aim at reaching that particular standard. If he is below that standard and no fault can be alleged against him I am quite certain the magistrates will deal with that case in lenient manner. Therefore I think you have no reason to put down the standard to this miserable low point that has been talked about; 2·75 and 2·8 I have heard talked of for butter fat, but you are going down in that case to almost the very minimum at which milk can be produced. I am a shareholder, with some other of my friends, in one of the London dairy companies, and I can only say that as a shareholder in a dairy company I know perfectly well that the gentlemen who control that business would know extremely well how to deal with a case of that kind. They are not going to suffer because they get some of their milk a little below the particular standard that you select. Now the question is what are the grounds on which I assert that 3·25 is a reasonable and fair and proper standard to assume for butter fat. Of course, my experience is not the experience, for instance, of one or two gentlemen, who, I am sure, must have been before you, because I am only a small country gentleman, living down in the country, and I have only my neighbours round me to deal with, and such journals as happen to fall into my hands—those are all my authority, and I have gained experience on my own farm, but I have also a little experience of some other farmers' cows in the way of communications made to me by some of the farmers of my county. I have asked several of them about it, and I confess I have been rather surprised at the readiness with which they have assured me that I was perfectly right in taking this higher standard. Now I should like to say this, that in going in for the somewhat higher standard, although I do not think it a high standard, but still a fairly high standard, of 3·25 of butter fat, I bear in mind that most certainly at first you will have a difficulty. I know there will be a great many farms at first that cannot produce it, but when the farmer gets a proper price and when he sees that those farms that can produce a better milk are getting, as they will get, an adequate remuneration for their outlay, my standard will be generally reached. The farmers will soon learn to hold together to resist the grinding they are put under now, and then, I say, the farmers will see that they can produce milk of this superior kind not to-day, nor merely in the winter months, but all the year round. The only difference that I can see between one farm and another in regard to the quantity of butter fat at this time of the year is in the feed of the cows. I give my cows, when I turn them out to grass, a certain quantity of decorticated cake and other things of that kind in small quantity, and the result is that I keep up my milk to a very good standard. I have been taking milk from some of my neighbours just now who were told not to send their milk to London, and they have sent their milk to me, and I have had it carefully analysed, and all I can say is that the milk I have had has been, except in the case of perhaps only one cow in a herd, or two, very much above the standard that I have mentioned. Now, I should like to say a few words about the grounds on which I state this. As I have said I do feel that I have hardly any right to come here and talk to you about personal experiences of this kind, because of course my experience is as I say extremely small, and you have had some of the best people and people with the most extensive farms in England before you, but as I have mentioned I have had the opinions of very many intelligent farmers given to me, and I do not think a single one of the class of farmers that I am speaking of has told me that he cannot do it or has raised any difficulty about producing milk in this way.

9973. May I ask you if they are all farmers farming in Wiltshire?—Yes, farming in Wiltshire. Not all, but chiefly so. Now I will mention one of them, a neighbour of mine, a man who keeps about 70 or 80 cows, one of the most honourable and best farmers I know in that part of my county. He said he was perfectly sure that if we were to put up the standard of milk under the name, I will call it, of "prime milk" to so high a standard as 3·5 per cent. of butter fat, he was quite sure that most people's milk would soon come up to that standard. Now I will mention another case. We have been endeavouring to get up a little feeling amongst those most difficult people to deal with—I do not know any class of men so difficult to get to pull together as farmers, but we have been trying for some little time in my county to get up an association of dairy farmers, who should stand shoulder to shoulder, and oppose the sweating process of the London dealers. We had a very interesting collection of these gentlemen one day at Swindon. It was at what we call the Western Counties Association of Dairy Farmers, and they were select farmers there, because they were representative farmers elected by their neighbours, and at that meeting there were gentlemen who came from Faringdon on one side—that is in Berkshire—and on the other side, down from Salisbury, Devizes, Chippenham, and all that country. I suppose there must have been about 15 or 20 in the room, and after our business was done, I asked them to wait a few minutes to allow me to put before them the proposal I made last year. I do not suppose gentlemen here read it, but I wrote a couple of letters in the "Times" about this unfortunate Food and Drugs Act, and I then mentioned the proposal that there should be a higher standard of milk called prime milk, which should have the proportion of 3·5 per cent. of butter fat, and the requisite proportion of other solids. I explained this to them, and asked them what they thought of it. One gentleman there said he thought 3·25 was quite high enough, and then there was a little discussion, and then one gentleman pulled out of his pocket the returns of his own milk, and they showed it was just under 3·5. Then I said "Now I should like to have the opinion of this meeting, and, with your permision, I will ask you to vote upon it." That proposal was carried unanimously. Then I said it was perfectly feasible for a very large amount of milk to be produced at 3·5, and that if that were made the higher standard there would be continually increasing quantities of it sent into the market, and it would be a great boon to the farmer. That vote rather strengthened my hands, and I felt then, of course, that I was on pretty sure ground. Then, since that time I have asked various people, as I have said, and quite accidentally the other day I came across a gentleman who had just come from Canada—a Mr. Dillon. He is an inspector of dairies and creameries, in Canada, and a very intelligent man indeed, who has had very large dealings with milk and its products, and I discussed with him then what he thought would be a good standard. He said the subject had been very much discussed all over America and in Canada, and they were always going in for low standards, but he always found that wherever a standard had been raised by the patrons—as they call the people who supply the milk—wherever patrons were paid for the quality of the milk they supplied, the quality went up enormously.

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and that, in point of fact, he was sure that 3·5 would not be too high really, and that it had been adopted by some of the localities on the other side of the Atlantic. In the United States, I believe there is milk of an extremely low standard, down as low as 3 in a great many of them, but he told me that there were certain places where it was raised to the higher standard. Then after he had left me, he wrote me this letter: "Dear Sir,—In relation to the conversation I had with you *re* the percentage of fat in milk, I wish to say that from practical experience in rather a large way since 1891, and from recorded tests made by other experts in Canada, the average percentage of fat in milk supplied to the cheese factories and creameries in Canada is not less than 3½ per cent.—Yours respectfully, John Dillon." There is his letter, and that is a gentleman who has had as large an experience, I am quite sure, as anybody in London in relation to this matter.

9974. (*Major Craigie.*) Is the average 3·5?—Yes, quite so, that is the average supplied is not less than 3½. I will give you further evidence about that directly. Now, in the next place, as regards returns from cheese and dairy factories, as I have said, my opportunities are very limited, but it is curious that they are very largely in support of what I have said. I may say that some of these statements, of course, are confidential, and I am quite sure that when I give you my word that they are what have been given to me, the Committee will allow me to be sufficient guarantee for them, or, if not, they must attach their own importance to what I say. I mentioned a gentleman just now who was a large farmer, and who was manager of a creamery—I think it was a creamery, although I believe they made cheese also—and I asked him what was the value of the milk that they received, and he said that at first when the factories started they had very poor milk come in, but gradually by asking for better milk and so on, and pressing for it, they had got better milk. But at last he said they had to make it to the interest of the persons who supply the milk, that they should supply good milk, that is to say, their milk was paid for according to quality, and that after that the quality of the milk jumped up. It was never less than 3·25 in summer, and in winter it averaged as high as 4. Now, that gentleman is known to Mr. Farmer, and he is a man of perfect honour, and, of course, I do not wish to state this fact otherwise that as it comes from him; but I am perfectly certain that he is a man who would rather understate than overstate a thing of that kind.

9975. (*Mr. Barham.*) Had he his figures and facts before him when he gave you that information?—No. It was not necessary. He is a very good farmer, and knows the thing very well, and I took his word. As to his books he would not state a thing of that kind if he had not authority for doing it. Then another case was this, and it is also a case which I know very well, because I had to do with one of the managers of it. He also could only give me certain particular percentages; but I have got the details of them from day to day. At an early day in March in 1897 the percentage was 3·41. On the corresponding day, I think it was the 7th May, it was 3·39. The yield in the month of April, 1898, was 3·446.

9976. Excuse me a moment, are not those the averages of the month?—Yes, these are the averages. The yield in May was 3·433, and in July 3·486. Now one return in this case I have excluded, which was sent from a farm from which the milk yielded only 2·6 of fat. The farmer was asked how that was, and he said he had taken a little cream off the milk. That is why I have not included it. Whether any other farmers ever took cream off their milk is of course locked up in their own bosoms. No sooner was this gentleman informed that they could not take milk so low as that, but up at a bound, to use my friend's phrase, it went, and it went up to 3·4, and then after that he went on like other people, and all I can say is, *ex uno disce omnes.* Now, I have mentioned also other sources of information which were culled from various journals. I am sorry to say, living down in the country, I have not got all the journals, and I have not got time to go and ferret through them all, but I have one or two that I have hit upon and taken haphazard. This is the journal of the Highland Society of Scotland for 1897. I do not suppose there is anybody at this table but shares with me my feelings of respect and admiration for the way in which agricultural matters are dealt with in the sister country of Scotland, and the record that I am going to give you is the record of a large series of experiments on the effects of different kinds of food on milk at Newton Farm, Glasgow, by Mr. Speir, who conducted the experiments with sets of eight cows.

9977. (*Chairman.*) We have been given all that; Mr. Speir has been here?—It is most natural you should have had it; but I think you will find the result will be that the average per cent. of butter fat from the whole was as high as 3·76. One went as low as 2·6, and one went to 3, but these cows were fed on what Scotchmen know I believe under the name of draff—a very poor kind of food. I think when you have got only two averaging so low as that, and when you take into account that all the rest were 3·76 and upwards, I think there is a strong argument at any rate there in favour of the standard of 3·25 not being a very high standard for Scotland. Then you have also no doubt had Mr. McConnell before you. I was only the other day going over a speech of his on this subject, in which he advocated a percentage, I think, down to the level of the analysts' percentage. I need not give you the details, because you will remember them. You will remember how his own cows gave a percentage of 3·6 of fat, but he was content to go down to the percentage of 3. Of course, I know, and you know, quite as well as I do, that that was made somewhat, no doubt, as an excuse, because the other solids, which are, after all, quite as important on this question as butter fat, were distinctly below the average.

9978. (*Mr. Barham.*) Mr. Speir has been here and given his evidence, but it may not be exactly in accord with what you have said, and Mr. McConnell also has done so, and he may not be in exact accordance with your evidence, and, that being so, it is a little difficult for you to summarise their evidence and draw conclusions from it, when you have not actually seen the evidence, as I presume you have not, that these gentlemen have given?—I have gone through all the figures in the journals I have read, and I should not put them forward here if I had not only done that, but calculated them myself. I may have made some mistake in the figures, but my calculations are what I consider to be the truth. If I differ from Mr. McConnell or Mr. Speir I should be glad to know and recognise my mistake.

9979. But we cannot point it out to you without going through the evidence?—I am not going to trouble you with anybody's evidence, but only to tell you the conclusions I draw from a very valuable set of experiments which made a great impression upon me. I may be wrong in thinking them important, but I give to you what I thought about them. Then, may I ask, have you had any evidence from people in Canada?

9980. (*Chairman.*) No, not from Canadian witnesses?—Then I mentioned just now Mr. John Dillon. Mr. John Dillon had only reports of one and part of another year, but he handed them over to me, and I will give you the results of them. I give you in brief the summary, and I can easily give you all the details if you wish me to furnish you with them. This is a summary from the third annual report of the Dairy Commissioner for the Dominion of Canada. This was done about two or three years ago, and it is all that he had in his hands at the time. Now, I give you first of all the period, the places, the pounds of milk and the percentages of fat. The first period that I go to will be the winter period, from November to April. The dairy station was at London, in Ontario. The number of pounds of milk was 122,370, the percentage of fat was 4·03; at Woollmer, in Ontario, the pounds of milk were 302,728, and they gave an average of 4·06; at Mount Elgin there were 497,274 lbs. of milk, giving an average of 3·99; at Perth, Ontario, there were 5,000 lbs. of milk, which gave an average of 3·52; at Woodstock 345,236 lbs. of milk gave an average of 3·97. Now I take from May to November. I have not got them specially for each month here; they are only given or summarised in that manner in the report. At Vernon River Bridge there were 2,228,295 lbs. of milk, which gave an average of 3·5107; the Kingston Dairy Association, with 2,947,475 lbs. of milk, gave an average of 3·71. Now I will ask whether I am justified. Of course, it is a matter for your Committee, but you will say that perhaps in Canada things are very different from what they are in England; but in Canada you have an enormous mass of milk sent in by patrons, who are paid according to the quality of their milk, and you have there, I apprehend, a real genuine sample milk, fairly produced from shorthorn cows, as I understand, and you see that there is not a single one of all those cases that is below 3·5. The lowest is 3·52, and that is where there are only 5,000 lbs. of milk. All the others are above it, and they

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oscillate between that and 4·06. Now those, I think, are important, but I do not wish to attach too much importance to them. Then, finally, I, of course, will come home to my own farm and business, and there I may say that I have only lately taken my home farm so far in hand as to look after it a little bit myself, and I have a man there who is competent to deal with these questions, because I thought it was my duty in my position in the county to try to do something towards showing how farms could be worked even in the ordinary way and with the ordinary appliances of a farm, and how, for instance, ordinary cowsheds could be put into proper condition for milking and wintering cows without great expense, and how taking no special precaution in the selection of your cattle to get any except such as you would find in the market, you may really raise the quality of your milk very considerably. I do not know whether I have got mine to rise or fall, because it is only quite lately that I have got to work upon it, but I have lately introduced means of determining the butter fat by the Gerber modification of Babcock's machine for testing. I have got 23 cows in milk at present out of 25, and there are three Jerseys, which I throw out altogether, because their milk at once raises the standard very much. I will take the mixed morning's milk of the first six cows that came. My man is very much occupied, and he cannot always be giving up all his time to it, but the first six cows yielded a percentage of 3·483 of butter fat. This was a few days ago—on the 16th April that was.

9981. Is that the average for the day?—Morning's milk. Of these, one cow, named Violet, gave only 2·9. I mention these things because you cannot go by a single cow. This cow, I have no doubt, had met with some excitement which affected it—perhaps a dog had gone at it, or something or other of that kind, but it gave as low a percentage as 2·9. Then, on May 1st, the same cow gave 3·5 in the morning and 3·7 in the evening.

9982. (*Professor Thorpe.*) The intervals of milking being what?—Even hours—four in the morning and four in the afternoon. It is a great thing having equal times between the milkings. Then I may say, moreover, there were two other cows, Pretty Maid and Handsome, and they both gave 3·3, but on May 1st Handsome gave 3·4 in the morning and 4·05 in the afternoon, and Pretty Maid gave 3·1 in the morning and 4·2 in the afternoon. These are cows which I should throw out and should not keep, because I do not look upon them as cows you can rely upon. Then, on another occasion, we had a sample from the same cows. On April the 25th the mixed morning's milk of 11 cows gave an average of 3·018. Again one of those cows only gave a result of 3 and another 3·2, which shows that if anybody will only keep a careful look out upon their cows, and reject those that are the exceptional ones, they can always have a standard which is very much higher than what is generally put down as being the possible average of a particular cow. Then, on April 30th, the whole of the evening's milk was mixed in the vat, and the sample gave 4·45 of fat. On May 1st the morning's milk of the cows averaged 3·8 and the evening's was 4·15. The lowest cow there was 3·7.

9983. (*Dr. Voelcker.*) Was that the morning?—No, that was evening. The morning's milk was 3·8 and the evening's was 4·15.

9984. But do you know the morning's milk of that cow?—No, I do not. I have not got the morning's, and I only mention it here because that was the lowest cow, and I can do the same, if you like, for the morning's milk too. On May 2nd the evening's milk of seven cows, including two Jerseys, average 4·48, and excluding the Jerseys it was 4·1. That was on the 2nd May, when the cows were out at grass. In all other determinations, as I have said, I have omitted the Jerseys. Now I will give you the results from the milk of a neighbouring farm to mine—a very interesting case, because it shows what the average of the farmers' milk is when he does not feed, and it also shows how it stands as contrasted with my own, for the farms are very similar, and I suppose if we changed cows to-morrow, and I treated his for a week as I do mine, and he treated mine as he does his, the results would be very much what they are now on our respective farms. On the 17th he sent four churns in to me which people in London would not take, containing 68 imperial gallons. They were carefully sampled. The evening's milk only gave 3·5 per cent. On April 30 a like quantity was delivered, and it gave a percentage of fat of 3·6.

9985. (*Mr. Barham.*) That will be the evening's milk again, will it?—Yes; that will be the same.

9986. (*Mr. Farmer.*) Do you know the morning's milk of those?—No; I have not got it. The morning's milk probably went to Swindon or some other place. The cows had no other food than grass, but mine were assisted with a small quantity of cake. These results were really accurate, I believe, and they were made by my bailiff, who has had a great deal of experience in a dairy factory, and he had used the Babcock machine hundreds of times. I suppose, before he came to me. So much for that. I hope I have not failed in showing that a percentage as high as 3·25 is not a very great demand to make upon the agriculturists of the country. I maintain that if they are properly paid for their milk, and it is made worth their while, and they are encouraged and shown how to do it, that they will produce milk as good as the milk I have mentioned to you among these very best cases. Of course, at present they are under the harrow. They are poor men, and farming is down. They get only this very low price for their milk, and, as I have said, they have foolishly allowed the manufactured production to slip out of their hands. They are no longer manufacturers, but only producers of the raw material. The raw material as it goes to London, of course, gets very skilfully manipulated, and it can be toned down or toned up to any value that you please. I am bound to say that I believe if really good milk could be guaranteed to the public, the public will not quarrel with the payment, even although it is at the rather exorbitant prices they are paying now for milk in London.

Now, my lord, if I may, I will just go on to another point, which is a point with regard to which I really first took up this subject in public discussion at all, and that is what I call prime milk. Of course, a very large quantity now of what I call prime milk, that is, milk with a standard of 3·5 of butter fat, goes up to London. I suppose as to a quantity of milk from the better farmers, possibly they get a little better price. I know I do. They would get perhaps, a small sum more for it. But a great deal of the milk that goes up to London quite comes up to my standard of 12½ of solids, of which 3½ are butter fat. I may be asked how far this question has anything to do with your inquiry; well, what I want to do is to get a second standard—to get a fair, honest average that would tend to lift the quality of the farmer's milk, and at the same time supply the public with really good, sound, genuine milk on the one hand (at the lower standard), and on the other hand with a superior milk, something analogous to what is now sold by Welford and some of these establishments in London, under the name, I believe, of nursery milk (at a higher standard). Under that name they sell now a higher quality of milk, and I maintain that such a higher quality, if it were standardised, and if it were to be said that 3·5 should be the standard of such higher quality of milk, it would encourage people to ask for that quality of milk; and I know that if the public asked for it, and asked for it as they would in larger quantities, larger quantities would be supplied without the smallest difficulty by the agriculturists of this country. I dare say the middlemen would not like it. The middlemen, of course, would like no standard at all. They would rather prefer that you should have a standard, if you have any, of 2·5, or something of that kind, because they can deal with the milk as it comes to London, and they can make it high or low, just as they please. But I maintain that if there was a sort of semi-official standard which should be known by the name that I proposed, that is, the name of prime milk, it would to some extent meet the difficulty. I believe my friend the President of the Board of Agriculture sneered at it rather in Committee; but I hoped, at any rate, that he was going to accept it; but, however, he objected to it, and threw it out. Now, I propose a higher standard of milk under the name of prime milk, which should have a percentage of 3·5 of butter fat, and I have said I consider that very low, and I should hope it would be raised in the course of a few years; but now, of course, it is a question whether this Committee can propose anything of this sort. What I think is that the proposal might be made. A suggestion might be made not to make it under the Food and Drugs Act a legal standard, but at any rate that it should be recognised as a sort of understood or trade standard, and that milk of that quality should be ear-marked with a name that should give a value in the eyes of the consumer, and have the character of a trade guarantee. I think the evidence I have given has shown that, at any rate, where you get an average so high as in those particular examples that I have given you, a very considerable

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quantity of milk would be of the higher quality. Of course, this Committee has nothing to do with the other questions that are connected with the matter, and I regret extremely that the question before you has been so narrowed down to this one simple question of a milk standard. I think there are other questions that ought all to come under the Board of Agriculture, such as the question of dairies and milk shops and cowyards, and all that sort of thing, connected with the management and cleanliness of dairies. The condition of dairies is, at present, a scandal; anybody who knows the state of a separator when a quantity of milk has been separated will recognise the filth that is drunk every day by people who drink milk. Really, if the distributors of milk would do one thing, that is, if they would separate all their milk and then recombine it in such proportions as may be considered right, I believe they would be conferring a great boon on the public, because an enormous quantity of these horrid, filthy microbes and bacteria and unwholesome products of the dirty dairies get into the milk, that would be separated in that way, and certainly the public would thank the middlemen if they would perform that operation. I know there would be some question about the mixing, but I do not believe there is anything in that. I think if it is properly done the cream and milk could be immediately mixed again in such proportions as that they should be perfectly amalgamated, and that a great boon would be conferred upon the public thereby. I am sorry this Committee has nothing to do with it; but perhaps if I may be allowed just to mention it, and to put it on record, I think it might do some good some day, if anybody ever reads evidence of this kind.

9987. (*Chairman.*) You say that you think the ideal standard which could be easily reached in this country would be 3·25 of fat and 8·75 not fat?—Yes.

9988. But you say that to reach that standard it would take a little time for the readjustment that people would have to make in their herds and in their food stuffs?—I believe, if that standard was proclaimed, say, for next July, as coming into force in July, you would find the largest quantity of milk that would come into the market would meet it.

9989. But you think two months' notice would be sufficient?—I do, because these are the bad months, and the grass is very succulent and milk is plentiful, and consequently the solids are smaller in proportion. But I believe at this moment the farms are producing that. I may tell you that at this moment I know of a man, and I could mention the name, who is a purveyor of milk on a very large scale to a large town, and that man has in his house a number of these Gerber apparatus, for determining the quantity of butter fat, and he tests all his milk for butter fat. He buys a large quantity of separated milk, and I happen to know that the milk that that gentleman sends into the market has actually almost absolutely universally 3 per cent. butter fat; and I say, what becomes of all this separated milk that he buys?

9990. Is this man a farmer?—No, he is a dealer.

9991. Then you do not think that there would be any difficulty in keeping up this particular standard in May and June, do you?—I do not. After a year, when once the farmers have got the scent, or when once the farmers know that they have got to rise to that standard I am confident that you will find that they will rise. They do not do it now because there is no compulsion on them, 3 per cent. now is all they have got to reach to, and a great number of them reach that. I know it.

9992. Do you know what the standard proposed by the Aylesbury Dairy Company is?—No, I do not know.

9993. We had evidence two days ago that they stipulate with their farms to supply 3·25. At this time of the year, over a series of years, they have very great difficulty in reaching it?—If they will give a better price I think they would get it.

9994. They say they have no difficulty in getting it at other times of the year, but just now they have?—Just now I assure you there is a great deal of butter made over the country—more than people think—and there is a great deal of milk separated besides.

9995. Is it not your experience that when cows are on the grass it is very difficult to get them to eat cake?—No, not at all. On the contrary, my experience is that they do eat it. I am giving it to them every day. Each cow gets about 3lbs. of cake, and they eat it with great gusto, and there is very good grass for them, too.

9996. (*Dr. Voelcker.*) What cake is it?—I believe it is decorticated, but we vary the cake. You cannot give them very much linseed cake.

9997. (*Mr. Barham.*) How long has your experience of farming extended?—It is very short—twenty years. I have not had a large experience, and practically I have not taken very much trouble about my cows till lately; but being in the position that neighbouring farmers know me, and placed in rather a responsible position as Chairman of the Agricultural Committee of my county, I think it is my duty to go into these questions and examine them.

9998. What time of the year is it that the farmers send you their milk that they cannot send to the dealers?—A good many times. This is one of the times.

9999. And you get this milk from these men, because the London dealers refuse to take it?—Yes. I understand the London dealers make a very rigid law. But there are dealers and dealers. One, for instance, may only get a bare fivepence for his imperial gallon of milk, and he is under this obligation, that if the firm does not want the milk they will telegraph down to him, and say we do not want any more of your milk for such a time. Then he is on his back, and he does not know what to do, and he looks about. It is only one or two I have done this for, but one or two have come to me because I make cheese if I cannot sell my milk, and I always make a certain quantity of butter and feed my calves and pigs with the separated milk, and all that sort of thing, which is of assistance to me, and, therefore, I am able to deal with the milk, which my neighbours cannot.

10000. Taking the man who sent back his milk in April showing 3·5 of fat, was that rejected by the London dealer, or simply refused?—They had telegraphed down, as I understand, and said they did not want the milk. In fact, they had got more milk than they wanted. There is an enormous quantity of that milk going into the market just now, and if London does not consume that milk somebody must, or it goes to the pigs, and it is better for those people to sell their milk to a neighbour who will use it, than give it to the pigs, or throw it away. That is how I came to have to do with it, and to know a little about what these farmers are doing.

10001. Then, I understand you to say you would recommend a higher standard than what is now known as the analysts' standard, because it would prevent the middleman dealing with and toning down the milk to a low standard, while the farmer would have no difficulty, in your opinion, in getting up to your higher standard?—Quite so, and I put before the middleman, the farmer, and the interests of the public. I think you ensure to the public a much better milk than they are drinking now, which is very poor stuff. You insure much better milk, because 0·25 of fat makes an enormous difference in the milk, and you are improving the supply to the public proportionately by that.

10002. Sir George Brown told us yesterday that an adult ought not to drink milk with a higher percentage than 2·50, and that personally he preferred 1·50?—You must ask the Doctor what he thinks best for a particular digestion, because that will depend upon the person.

10003. But he was talking generally, and he said that an adult would digest it better with that percentage of fat?—The human adult do you mean?

10004. Yes?—Then why is it that mother's milk is so much richer?

10005. He said that human milk was only 2·40. I was told that by Sir George Brown?—Is that so.

10006. (*Dr. Voelcker.*) He did say that, but he was not right?—I am only talking from memory; but my impression is that although it is not as rich as an elephant's milk, there is a good deal of butter fat in it.

10007. (*Professor Thorpe.*) I am sorry I was not here to challenge that statement of Sir George Brown's?—But, however, mine is only an illustration. I did not mean it as anything more than a joke.

10008. (*Chairman.*) It is a question of value to the human frame?—It is not a question of what the doctor says is good for you; but what suits your taste. I do

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not suppose that doctors would recommend you to drink champagne at 7s. or 8s. a bottle in large quantities.

10009. (*Professor Thorpe.*) In König's "Nahrungs und Genuss-Mittell," a compendium giving the composition of all varieties of foods, and which is recognised as a standard work, the average composition of human milk is given as regards fat as 3·78; but, of course, human milk, like any other milk, and probably even more than any animal milks, is subject to wide variations?—That bears out what I have said then; but that was only an illustration. My argument is that the public would prefer, and do prefer a good milk, a milk, that is to say, which is rich, and they are willing to pay for it. In fact, they do pay now very largely for by no means a superior milk, but I say that if you can get a farmer generally to produce a milk even of so low a quality as 3·25, you are very much advancing and improving the milk that is consumed in the cities, and at the same time you are, I believe, doing the farmers the greatest kindness you can. I am quite sure there is nothing so likely to help the dairyman as compelling him to give a fairly good milk, and consequently in the end getting him a better price for it. I am thoroughly satisfied that is the case.

10010. (*Chairman.*) You gave us some statistics taken in April, May, and July, showing a high quality of milk. Have you got the maxima and minima of those?—I believe I have.

10011. Can you say how low some of those milks went?—Yes, I think I can.

10012. You told us those were the averages?—I do not think I can give you them now; but I can supply them.

10013. It would be rather useful for us to know about that?—I quite feel the importance of it, but I did not think of it when I was drawing out my statement; I have got some figures here for the Canadian ones, and I have got my own for each cow. Here are some I can give from that factory that I was speaking of in March.

10014. But the figures you mentioned were for April, May, and July, and you told Mr. Barham that they were the average?—I have got them for April, May, and July of 1898, and I will read them out as they go down. These are the separate days of fifteen days, that is a fortnight: 3·25, 3·7, 3·5, 3·2, 3·5, 3·25, 3·5, 3·3, 3·4, 3·5, 3·5, 3·3, 3·7, 3·8, 3·3. Those are the April ones.

10015. Morning's milks, or mixed?—I believe mixed.

10016. Mixed, morning and evening?—I think so. The average of those is 3·446. Then May was 3·4, 3·6, 3·4, 3·4, 3·4, 3·3, 3·35, 3·5, 3·3, 3·5, 3·3, 3·45, 3·4, 3·6, 3·6, 3·4. The average of those was 3·433. July 3·4, 3·6, 3·6, 3·5, 4, 3·4, 3·4, 3·6, 3·7, 3·3, 3·7, 3·4, 3·6, 3·5, 3·6. The average of those was 3·486.

10017. Those are milks supplied to a factory, are they?—They are milks supplied to a factory direct from the farmers.

10018. And the factory pays them according to quality?—Yes, that is so.

10019. Therefore, you would like for those milks to be of high quality?—I should like for those milks not to be tampered with. That is the way I put it. I do not like to say any more about my neighbours.

10020. At all events, if they are paid for a high quality they will strive to attain it, you say?—They will strive to attain it, and they will not take any steps to diminish it. That is to say, they will milk out their cows at once, and not separate the "strippings," and they will not mix anything with the milk. That is what it really means.

10021. Do you happen to know if the cows in the Canadian's farms were Government farm cows, or cows of the ordinary farms of the country?—Of the ordinary farms of the country, what they call in Canada the patrons. Patron is the word they use there for the farmer, that is in the Co-operative Company, or whatever it may be. But I have not got all those here.

10022. Now one question as regards the prime milk that you think might be sold as in a standard by itself. There would be two classes in your scheme?—Yes.

10023. One for the prime?—Yes.

10024. And another for anything below that?—Yes.

10025. How would a man do it in practical work, because he could not take an analysis of the milk he was going to send down the street then and there?—No. Who is the person who does it? That is the first question. The person who supplies the milk, the caterer, certainly can do it. There is no question that he can, if he chooses. In fact, I instanced a case just now of a caterer that I know very well about, who does do it. He has this very simple machine—he has a lot of tubes in the Gerber machine, and he just takes one sample to one and one to another, and so tests each for its proportion of fat, and if they rise above 3 per cent., there is separated milk on hand.

10026. You think any retailer can get a fair analysis of his milk in time to deliver it, do you?—Yes. He ought not to be a retailer if he cannot. He must be a very small man.

10027. (*Professor Thorpe.*) I think his Lordship has gone so fully over the evidence with you, and you have given it at such length, that I do not know that there are any points that occur to me except that the Committee would like, I think, to have some observations from you, if you can give them to us, as to the necessity of having standards for other milk products—whether, for example, it is desirable to have a standard in respect to skimmed milk, and whether it is desirable to have a standard in reference to cream?—Cream I have more difficulty about. Solids I have none about. I feel confident that you ought to have a standard for selling separated milk, and I do not think you can put that very high. I should say that if you took the milk as separated from the standard which I have advocated of 12 total corresponding to 3·25 of butter fat, that would be a very good standard to take, if you stick to that.

10028. But is it desirable that we should have any standard at all as regards the amount of fat in separated milk?—No, I should say nothing whatever as regards fat. The presence of fat is supposed to be altogether excluded. I should not reckon it.

10029. Then do you think it is necessary for us to draw any distinction between hand skimmed milk and machine skimmed milk?—No, I do not think there is any necessity for doing it. I mean if milk is going to be sold as separated milk, you may depend upon it the person who sells it will not sell skimmed milk unless he gets a better price for it than as separated milk. I do not think you can discriminate between them.

10030. But is it not the fact that persons have considered themselves prejudiced when they have been supplied with machine skimmed milk when they have asked for ordinary skimmed milk, meaning thereby, hand skimmed milk?—I do not know. I have had a good deal to do with this question in another form. I am Chairman of the Committee of North Wilts for the administration for the Food and Drugs Act, and have had a good deal to do with this question of skimmed milk, but that has been chiefly in respect of that other stuff, the condensed milk. It is chiefly in respect of that that I have had to do with it, and I do not think I know of a case ever coming before me of skim-milk as such *versus* separated milk, otherwise than in condensed milk.

10031. You mean of the substitution of separated milk for skimmed milk?—Yes. I do not think so—*qua* separated milk and skimmed milk, except in connection with condensed milk. There we fought it out, and the two things are not the same at all.

10032. From your experience as a magistrate, do you think there is no practical necessity to trouble as to definitions of standards for skimmed milk no matter whether it be hand or machine skimmed?—No, I really do not think so.

10033. Then, as regards cream?—There is more difficulty there.

10034. Have you any suggestions to offer as to the amount of butter fat which cream should contain?——No. I feel great difficulty about that. I know I sell cream sometimes, or my bailiff does, and he sends it to Oxford, but people in Oxford will only have cream that will almost stand up solid. But the thing they sell is that same thing diluted to a very large extent. However, really I have not gone into the question personally of butter fat in cream; I have never had it before me at all in either my magisterial capacity or as chairman of the Committee in any way, so that really I should not like to give an opinion upon it.

10035. But, speaking generally, do you think the public is in a position to take care of itself as regards cream?—I am afraid I have a very small opinion of the intelligence of the public in respect of any of these matters. I do not think the public, as long as it gets thick and thin raises any question. That is its idea of distinction between cream and milk. That is their idea, and I, myself, should not like to hazard an opinion which I have not thought out for a basis for you to go upon, and I really have not thought it out. I could not give you an opinion upon that. I have never had it before me as a magistrate.

10036. (*Major Craigie.*) There is only one question that I should like to put. I want to be quite clear that you do propose to have two effective standards?—I wish to have them, but whether there can be two standards under Clause 4 of the Act or not I do not know. I am certainly in favour of one, that is the first standard I have mentioned, and as regards the standard for prime milk I wish I could see it introduced. I am in favour of it being done certainly.

10037. The reason for my question was that in the correspondence we had with you last year at the Board of Agriculture I rather gathered that your intention was at that time that all milk should be sold as genuine provided it was not proved to be adulterated, but that the standard should be only one, and that was to be that of prime milk?—Yes, that is what I proposed. That was before the Bill was in the House, but you understand, of course, that what I was trying to do then was to get a thing passed which I thought would pass, and when I found that my own scheme was rejected by the President I felt then that the thing to do next was to look about for something that would at any rate prevent what I think are the great wrongs that are being done in the country now to farmers and the public in the selling of milk at any standard you like.

10038. Therefore the Committee may take your evidence that you have been good enough to give to-day as the proposition that you would make after the passing of the Bill?—Yes, after the passing of the Bill. That is what I say exactly.

10039. And that anything that was said before should not be regarded as contradicting it?—No. As I told you, before the passing of the Bill, I had been in the House of Commons a good many years, and I knew about Bills and the way they got through, and by that I saw that if I was going to suggest two standards I should simply fall between two stools, and that probably the lower standard would be taken, which would be of no use. Therefore I went in for a high standard, and I was confident that the agriculturists could reach it after a time, leaving the lower standard to shift for itself. That is what I did then.

10040. (*Dr. Voelcker.*) Have you any decided preference for a statement of total solids, inclusive of so much fat, as against a separate statement of fat and solids not fat?—I am very much in favour of stating the total solids as including fat, certainly.

10041. Will you give us your reasons for that?—My reason is because I believe myself that if you separate the two things you would be having your milk all manipulated just to meet those two things. For instance, if you put too high a standard on solids as compared with fat you will have all the more separated milk put into your milk, and if, on the other hand, you put a lower standard, you will have water. That is all.

10042. You believe that the statement of total solids inclusive of fat would eliminate more adulteration than otherwise?—Yes, I do certainly think so. I do not think you can eliminate all adulteration, but I think you should reduce it to a minimum as much as possible.

10043. But at the same time you think that an improvement of quality would be effected more in the direction of the rise of butter fat than in the rise of solids not fat?—Yes, I do, because the fat is the more valuable constituent in the market.

10044. Do not you think that from looking at statistics of milk there might be considerable difficulty in getting as much as 8·75 of other solids?—You mean in view of Mr. McConnell's evidence?

10045. Yes?—My answer to that would be this. As I say Section 4 of the Act is a saving clause, and a case like Mr. McConnell's, if brought before the magistrate, would be at once dismissed. He could show that the relation of butter fat to solids in his particular district was somewhat abnormal and continuous more or less, and I am quite sure that there is no Bench of magistrates in England that would listen for a moment to the suggestion that they should condemn in a case of that kind with evidence of that kind. They would never think of condemning a man under those circumstances. That is really the one good thing I see in this business that is before this Committee, that really there is a loophole, there is a certain amount of elasticity, and if there is anything wrong a man cannot be wronged if he can bring evidence that he is dealing honestly and justly, and that the stuff he is producing is really of good quality, or sufficiently good quality, for the use of the public.

10046. Then, in taking a standard of 12 per cent. solids, of which 3·25 must be fat, you would not wish that to be taken as definitely implying that the milk must be 8·75 in solids not fat?—Not absolutely, but I should say that unless a man could show there was some excuse for it that certainly should be taken as the standard.

10047. Then have you had a good deal of experience with regard to dairies connected with schools belonging to County Councils?—No, I have not. I have not had anything to do with them except as connected with a Committee of the Bath and West of England Society.

10048. But are you aware, for instance, of the quality of the milk supplied to cheese schools?—I have had very little to do with them. I have, of course, had a very great deal to do with the butter schools in my own county, and something to do with the cheese schools. But some of these cheese schools have not succeeded very well. I may mention one case in the neighbourhood of Lavington, where we had our cheese schools with a most excellent farmer, and during one of these extreme droughts—I think three or four years ago, I forget the year now—but during one of those extreme droughts when I went down there I happened to be there just at the time when a great change had taken place. They had been making a considerable quantity of cheese from their milk for some time (I think it was in July or August—July, I think), and all of a sudden it dropped, and the weight of cheese they could produce from a certain quantity of milk dropped suddenly very considerably. I went through the books and looked into the thing closely, and was quite satisfied that it was that the cows were not producing from the same quantity of milk the same amount of casein, so I asked the dairy woman to let me know what the result was afterwards. Then there came a change in the weather, and in a fortnight I understood the milk had gone up again to its original standard. Now, of course, a thing of that kind may happen from time to time, and I consider it is quite within the scope, not only of the magistrates, but of the committees of the county that sit on all these different Food and Drugs Act questions, to determine whether they should prosecute in a case of that kind where it was connected with a milk supply. For my part, I should tell my very intelligent inspector that he should not prosecute in a case of that kind, because I should feel that there was a really good excuse for it. But, of course, I should go into the question before dissuading him from prosecuting in a case of that kind. But then, on the other hand, there must be sound evidence for the cause of a change of that sort.

10049. These instances refer rather to milk as a means of producing cheese, but could you tell us at all whether as regards fat the experience of the schools is not to the effect that when farmers know that the milk was being tested as it came in there was no difficulty of getting a good quality of milk?—Yes, I maintain that absolutely, if the farmer knows his milk is being tested, and especially if he is paid in proportion to the quality of his milk. That is the point. If he knows that it is to his advantage to sell a good and pure milk I am perfectly certain that the average standard of milk will rise all over the country directly. The farmer can do it more or less. But you can effectively help him in doing it by putting the standard at a point at which you feel you are not being hard upon the farmer when you tell him that he ought to reach that point.

10050. The experience of dairy schools has been that where a good quality of milk has been demanded it has been supplied, is not that so?—Yes, where it is made worth the farmer's while.

10051. Then in advocating two qualities of milk, prime and seconds, would you limit the sale of seconds by a standard which should necessitate the milk being free from adulteration?—You mean by second standard the lower standard.

10052. Yes, or would you admit a standard so low that adulteration was possible?—I really do not know. It is a very difficult thing to say what standard you can put which will be such that you can say adulteration is impossible, because supposing you had a case where you have got a small quantity of solids in proportion to the butter fat you have only got to put some concentrated separated milk and there you are. You proportion it at once.

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10053. Taking the higher standard for pure milk, there is very little doubt it would have to be genuine?—Yes, genuine, but I should not consider it adulteration if a man mixed milk of 3·7 with milk of 3·3 or 3·4 in order to raise it to 3·5. I do not think there is adulteration in that sense. You are not injuring the public, because you tell the public that the fat in your milk is so much as I say. You may be perfectly certain that the astute men who deal with these things will take very good care that the milk they sell is not very much better than that minimum, unless they get well paid for it.

10054. Then you would allow your low standard to be one which would admit of milk being adulterated, say, with water?—Not if I knew it, certainly.

10055. You would not put it much below what we might consider the limits of genuine milk?—No, I certainly should not do that. That I distinctly would not do, if I could insure it being good otherwise. But I think you could insure it better by the kind of standard I propose than by a lower one.

10056. You would not, in other words, allow milk of 2 per cent. of fat to be sold as milk?—No, nor 2·5; 2·7 I might.

10057. Therefore, in grading your milk you would not allow percentages of fat below a certain figure?—No, but it would be a question of price. I should not allow such milk to come into sale, or, at least, if it was in the market I should insist that the man who put it into the market should give a reason such as to satisfy reasonable men that he was not deceiving the public. I may mention a case, by the way, of some interest. I do not know whether it has been before you, but I had a case of a very low standard—2·7, I think it was, of butter fat in the milk—that was brought before me by the inspector. I never know the names in the cases. He never tells me, and very properly, who the people are or anything else, but he simply brings to me the results from the analyst, and I tell him at once that I think he ought to prosecute or otherwise. In this case the man who sold the milk brought forward the farmer, and the accused declared he sold me the milk and I transmitted it to the public exactly as I received it. In this case he proved it, and then the inspector arranged with the farmer who supplied the milk that he was to go and see the cows milked, because he said he was certain the milk was exactly what his cows yielded, and I have no doubt it was. The inspector went, but he took the precaution of taking an expert with him, and when he went into the yard a cow was brought out and milked, and then the expert said, "Will you request the farmer to milk out his cow, if you please," and the farmer proceeded to tell his man to milk out his cow. He did not like telling him at all to do it, but out came a quantity more of milk, the strippings of this cow. It was added to that other milk and the milk rose at once to a beautiful milk. That is a fact, and it shows the kind of slim way in which people do deal with these questions sometimes.

10058. Taking it as an established fact that milk drawn at uneven intervals during the day will vary considerably in quality, would you be in favour of fixing a different price for morning's and evening's milk, and the vendor to pay the farmer accordingly?—Unfortunately I am afraid we cannot interfere between the vendor and the farmer. That is the trouble. I do not see how you can do that. The vendor at present is master of the situation, and he can give the farmer as little as he may, and he can get the public to pay as much as they can, so that I do not think you can interfere between them. All you can do, I think, is to lay down a rule or to lay down a standard which you ought to expect the farmers fairly to reach for both morning and evening milk, and I maintain that morning milk might be easily raised to 3·25.

10059. Do you think it unreasonable to insist that farmers should milk their cows at even or nearly even intervals?—I do not think you can interfere in regard to that because of this. Supposing a farmer sends into the market a lot of morning's milk much below the standard. He is brought before the magistrate, and the magistrate says how is this? And he says, "Well, I really milk my cows at 5 o'clock in the morning and 4 o'clock in the afternoon," and the magistrate would say, "If you do that you cannot expect as rich milk in the morning," and he would probably inflict a fine.

10060. How would you get over that difficulty?—I should condemn the man for selling the inferior milk if it was of lower quality than consistent with the known differences of night and day milk. If you fix a standard and say he ought to reach that standard, and he does not take the precaution of reaching it, and is guilty of what I should consider to be contrary to good farming principles in milking, he must take the result. I do not think you should modify your standard to meet the case of a man who will not perform his duty by his cow.

10061. Then you think that it is not unreasonable to insist on something like reasonable intervals in regard to the farmer?—I should not interfere. I should leave it to the farmer's judgment to do equitably. A man cannot claim to be selling milk of proper quality when he only milks his cow at very different intervals. In fact, he gets more milk for the longer interval, but less butter fat in proportion.

10062. But would you make the farmer responsible for carrying it out in that way?—Yes, and not only that, but the *onus probandi* is on the farmer, and before the magistrate he has got to show that his milk is pure, and if he does not show that he treats his cows in a husband-like manner, then I should say I am sorry for you, but you must treat your cows better in future, and pay 5s. or 10s. or whatever the fine may be. That is the only thing to do in that case in my opinion.

10063. Then under your suggestion we might have evening milk sold under the description of prime milk, and morning milk sold as seconds?—Certainly, if they reached the standards.

10064. Then how would the vendor know whether the milk was evening drawn or morning drawn?—Do not you be afraid about the vendor.

10065. You think he will look after himself?—Yes, he is a very astute person, and I have great respect for his astuteness, I profit by it myself in a degree, because I get 6 per cent. now on some shares that I hold in one of these companies.

10066. Then your experience as regards farming is that methods of testing have been so very much simplified of late that there is no excuse for a farmer now not knowing what his cows are producing?—Not a bit—at any rate that he ought to know the average of them. For instance, I will tell you what I do now in sampling, and one of the difficulties in regard to the Gerber process comes in there. I have got a series of glass tubes that hold perhaps about 20 cubic centimetres. When the milk has been just milked my bailiff drops one of those slowly down into the milk, puts his finger on the top and lifts it up and transfers it, and just shakes it up, and that is what he examines. I say that any farmer who will do that sort of thing and carefully test his milk can test twenty cows in the morning. The only thing is that he has got to learn the trick—he has only to learn how to do it. It is not that his time is so very valuable, because he does not spend his time in either making cheese or butter—in fact I do not know what he does do except go into the neighbouring town to dine with his friends. Mr. Farmer is a very different man. Mr. Farmer works 20,000 acres, and I have no doubt he has a great deal more than he can do between milking and milking and that sort of thing; but as he knows a great many of my neighbours have plenty of time to do it—even their wives might do it.

10067. But in the farmer's opinion it would be quite sufficient for him to test occasionally the mixed milk such as it was away from his farm—is not that so?—Certainly.

10068. And if he found that it came below a certain standard which might be fixed by the Board of Agriculture it would be then his paramount duty to test the milk of his own individual cows, or some of them at all events?—Yes.

10069. And show which of them were failing?—Certainly. That is the scheme, and that is what I believe. I have only indicated my own process that I mean to pursue, but I believe that that process would be one that would succeed entirely in carrying out what I want.

10070. If a farmer finds that certain cows give ordinarily lower results he ought to draw them out?—Certainly, and fatten them up or sell them.

10071. In your case how may cows would be so treated?—At present I have not treated them, because I only lately began this process; but I have now four cows I shall certainly get rid of.

10072. Would these instances be enough to lower the quality of the milk sent away?—Yes, they might lower it by three-quarters per cent. or something like that.

10073. Would they be likely to lower it below 3 per

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cent. of the morning's milk?—They have not done it, but they may in certain cases.

10074. Does hand skimming of milk still obtain in the districts you are acquainted with?—I do not think so on any large scale; if it is done it is done on the sly. I mean to say I know it does happen, although I do not want to say much about it. Some farmers make butter who sell their milk and do not do anything else. That is asserted.

10075. I was rather referring to the old process of hand skimming for butter making, and subsequent use of the skimmed milk for calf feeding or even for human consumption?—I think it goes on to a certain degree. There are a good many separators about the country now.

10076. They are taking the place of the hand?—Yes, but they are not yet universal.

10077. You could not say there is any particular appreciation of hand-skimmed milk because of its containing more fat, could you?—No, I do not think so. Of course it is richer.

10078. You are aware many farmers use it for calf feeding?—Yes. I suspect if a farmer does not understand the use of separated milk in that way, and is not careful how he gives it to pigs and calves, he very likely may suffer by using purely separated milk. The other is very much better. But I find it better to give oily substances with separated milk to calves, and it does just as well as cows' milk.

10079. But would you recognise that the higher amount of fat would be an advantage?—Of course, there is no doubt about that.

10080. (*Mr. Cowan.*) Have there been many prosecutions of farmers for selling adulterated milk in your district?—I have, I believe, a list here. But the number of prosecutions is very small, probably because of the number of farmers whose milk we test. There is a very large number whose milk is tested, and I think I can tell you the number. From January, 1895, to March I asked my inspector to tell me something about this, but I do not think he has given me quite what I wanted. What he gave me was this, that in the case of foods that were purchased of samples between January, 1895, and 31st March, 1900, there were of milk 30 and skimmed milk five, condensed milk 13. Those were cases, I think of adulteration, but I am not quite sure.

10081. All by the farmer?—No, not in the case of the condensed milk. I am not quite sure that I am right in saying that that was the percentage, but I think it was, and that is in the course of five years.

10082. At any rate, there have been a good many prosecutions?—Yes, a good many were brought, particularly down in my district, about that, and especially about milk, because there is a very, very large population, 60 or 70 thousand people in Swindon, and they are poor people, or are artisans and persons of that kind, and I have made a very great point of trying to get them good milk.

10083. In that case I should like to have your opinion about the responsibility of the milk producer. Where should it cease? He is sending his milk to the large towns, and where do you think it should cease? Is it when it gets out of his possession?—I do not quite follow that.

10084. (*Professor Thorpe.*) The point that Mr. Cowan raises is, when should the responsibility for the custody of the milk cease with the farmer. Should it be when it is on the rail or at the point of ultimate delivery?—That is a very difficult point. It depends so very much upon the mode of transmission and who is the recipient. For instance, in Swindon, where I have had a good deal to do with this matter, there are middlemen, of course. They are small people generally, and there are one or two big ones. These people send the milk round, and we have to test it. The test being delivered if they can trace it to a particular farmer, we try and ascertain whether the milk from that farmer bears out the result that we have obtained from the distributor, and occasionally it does. There, of course, the responsibility rests with the farmer. Then we will take another case. The farmer sends to London a quantity of milk in these things that are called churns; they ought to be regulated, but they are not regulated now at all, and the farmer is very much cheated, in fact, by the churn very often. The churn, of course, goes on to the railway, and they are bound to be open, or the railway company will not take them. They are open, or they are so that anybody can open them—that is quite true. They can be examined on the railway by anybody, and they are sometimes, I am informed, stolen from on the railway in the passage from the farmer to the London purveyor. I know that one of the things we are always wanting to get is to have all these churns stamped by the weights and measures inspectors, and that wherever they are they should carry a legalised stamp to declare what their actual contents are, or, better, what is their tared weight, and that there should be a lock put upon the churns in transit, so that they should not be liable to be tampered with, as I am informed they are. I do not know anything more than in a general way, but that they are tampered with now I am informed.

10085. (*Mr. Cowan.*) That is the point that I wanted to know about—if you thought it was any hardship on the producer that he should be at the mercy of these people?—It is very hard on him; and I certainly think it should be rendered impossible for the employés of a railway company or a public carrier to interfere and tamper with milk *in transitu* in that way. Of course, we all know that sometimes we find a bottle from a case of wine has been tampered with. You will find in some very ingenious manner a bottle has been broken and the contents have disappeared. We very often know how that happens, and possibly something of the kind may happen with regard to milk; but certainly there is the idea that it is so. That is all.

10086. Would it be your opinion that in the interest of the producer, who is a very large class, his responsibility should cease when he delivers it either on to the railway train or the place of delivery in town under lock and key?—You mean between the purveyor in London and the person who supplies it?

10087. Yes. Railway companies will not allow cans to be locked, and do you say that if the purveyor puts it on the train locked, the producer should be free of it?—Certainly. The only thing is that the purveyor may be a very small man, and he may be victimised by a farmer. One farmer may send him an inferior article. He may distribute that innocently. Occasionally that does happen.

10088. There are dozens of farmers in your district who do that, are there?—Not dozens, but I am sorry to say not all of us are honest.

10089. (*Mr. Farmer.*) You advocate 3·25 per cent. of butter fat for the whole year, I understand?—Yes; I do.

10090. Have you considered that as far as May and June are concerned?—Yes, I have. Of course, as I say, in May and June you have months very hostile to the farmer from the weather, and from other reasons there may be a difficulty in producing a standard milk. But I think that might be considered by the magistrate, provided it was traced back to the farmer. So long as it is only in the hands of the distributor, I do not pity the distributor at all, because he can always enrich his milk.

10091. I have in my mind the case of a farmer, and I think you would admit him to be an independent farmer. He has a herd of about 70 or 80 cows, calving at the fall of the year, for the winter dairy, the milk from which cows averaged about 3·8 per cent. for the year; and when these cows were taken to grass this year, and fed with 6lbs. of decorticated cake and cotton cake in addition, the milk dropped to approximately 3 per cent. Would you be surprised to hear that?—Well, I am rather surprised; perhaps I should be less surprised if I had seen the land. Probably you know the land very well.

10092. It may be described as fairly good pasture land. What conclusion would you draw from that?—I could not draw any till I went to see the case, because what I should immediately do would be to examine his separate cows. I should find, probably, the drop was due to a small portion of the herd, and I should eliminate it.

10093. But it is the same herd that is giving 3·8 per cent., and now there is a decreased period of lactation?—Of course, I cannot prescribe to the gentleman, and you are probably more competent to do it than I am; but I should like to get to the bottom of the matter before satisfying myself that that was the straightforward condition of things.

10094. Would not you be inclined to think if those facts were put before you, and you knew nothing of the farmer, that probably there had been a great deal of butter made in that neighbourhood?—I should not think it possible for a man of that sort to do such a thing as to make butter; but if you ask me I would throw myself back on that dictum that I gave just now, that not all of

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us were honest. I should say that is an explanation, but, as he is a friend of yours, I cannot quite imagine that applying.

10094*. The Chairman of the Sanitary Inspector's Association produced here a lot of bottles used for sampling milk, and he said the worst one he had at all sent to him was one from Wiltshire?—What do you mean by the worst? Do you mean the bottles or milk, or the worst what?

10095. It admitted of tampering with the samples. It was a very large bottle with two small seals on it, and there was a possibility of inserting other milk or cream with a hypodermic syringe?—I never heard of that before; but I am surprised if that is the case, that I have not heard of it from our analyst, who is Professor Dyer.

10096. I give it to you for what it is worth?—Yes, and I will enquire about it, and ask Professor Dyer about it, because it is a very important thing, indeed. Our inspector is excellent in many ways, and a very accomplished fellow, too, and he knows a good deal. He has been a chemist.

10097. There is a point which occurs to me that I should like to put to you. You say that you do not object to mixing, what I think you said was 3·7 and 3·5 milk together, or shall we say 4 and 3 milk together?—I did not express any objection. I merely said what would happen, and if you name a certain standard you cannot prevent the people who deal largely in milk, and who necessarily mix a lot of milks together, doing so. They do not send each separate farms' milk out, but they give it altogether as it is brought them, and I do not see any harm in their mixing the different milks of different standards so as to reach a certain proper standard. I do not see any harm in that.

10098. Then, would you see any objection to their mixing the morning's milk containing 3 per cent. with the evening's milk containing 4 per cent.?—I do not see the least objection to it, if they please.

10099. They would then obtain 3·5?—Certainly.

10100. What would be the difference if he took off ·5 from the evening's milk and so distributed that milk fresh, and then added that ·5 of cream to the morning's milk. Would you object to that?—I am not going to support him in it. In the first place, if you took that milk I presume you would find that the solids would not at all harmonise with the quantity of butter fat in the milk. I mean if I was going to have that milk sampled my inspector would take a sample of it, and the analyst would say this is very extraordinary milk, it has got a great deal of butter fat and very little solid. You would have the proportion of butter fat to solids not correct, I think.

10101. Is that so?—I think so.

10102. How would it be affected?—If you took the cream off one lot of milk and put it on to another, surely you raise the percentage of butter fat in that second lot, and you do not raise the solids, and, therefore, the analyst who was examining it, would say, here, I have got only 8½ per cent. of solids, and I have 5 per cent. or 6 per cent. of butter fat. How can he explain that, except only in one way, that the man has added cream.

10103. You say, if I add half per cent. of cream to a pure sample of milk containing 3 per cent. of butter fat that I alter the proportion of solids?—Yes, you alter the proportion of butter fat to solids, certainly. There is no doubt about that.

10104. (*Professor Thorpe.*) It must follow. In a hundred parts the ratio of solids not fat must be depreciated *pro rata* according to the rate you enlarge the amount of fat?—I have no objection to it if I want lots of fat on it, but if I wanted to have a genuine article and only to deal in a straight way with the public, I should certainly not do it. I should not object to mixing genuine milks, because you cannot help that, and I should not like to interfere with the trade any more than I could help.

10105. (*Mr. Farmer.*) You think it could be detected?—Yes, in a moment. Ask Professor Thorpe, he could undertake to tell you.

10106. It appeared to me the same thing as mixing two milks?—No, it is not the same as mixing two milks. It is quite different. One is detectable, and the other is not really.

10107. (*Dr. Murphy.*) I want to know whether you think that the 3·25 per cent. standard could be enforced at once, or whether you think an interval of time ought to elapse first?—I should always give an interval of time in things of that kind. I said July, and I firmly believe that if you were to announce it at once, you would get after July very good returns at 3·25. On the other hand I would give them as much law as ever you like. I do not care how much law there is providing that you ultimately achieve what I am quite sure you will achieve.

10108. You referred to the magistrates taking into consideration some big variation in the weather?—Yes.

10109. That was as possibly explaining a deficiency in the butter fat?—Yes.

10110. How would they get that done?—There would be plenty of evidence. There is no difficulty in getting evidence of that kind. Of course we should employ a skilful person, an expert before the magistrates. But I never sit on the Bench before which these things come. I have given up sitting at Swindon, because I look upon myself as a sort of public prosecutor. But I am satisfied if a thing of that kind were raised there would be plenty of good, sensible evidence which the magistrates could rely on immediately to put that straight. There is no difficulty about that.

10111. You do not think that is a good reason for hesitating to fix a high standard?—No, that is not so. Magistrates are very loth as a rule to put in force this sort of restraints upon trade. That is so with the magistrates certainly all over the country, and in my county there are only two or three Benches that I can ever rely upon to be other than lenient. There is no fear of harm from that.

10112. (*Mr. Barham.*) When you are referring to the magistrates you are referring to magistrates in the country, of course?—To rural magistrates entirely.

10113. And not to the stipendiary magistrates of great towns?—No.

10114. You have never heard of their favouring the seller of milk, or accepting a low standard?—I do not know about stipendiaries. I have only to deal with the rural benches. I know them personally pretty well, and I think what I say will be confirmed by others.

10115. But the great bulk of the milk is consumed in the large centres of population, of course?—Yes, but these prosecutions take place much more in the rural districts. It is against the farmer they generally go. But I am not very well up in these statistics of legal prosecutions in London and other large towns.

10116. Your remarks refer to the country districts in that respect?—Yes, to the rural districts entirely.

10117. I will not follow you into all the abuse that you have laid upon the middleman?—I am a middleman myself, you see, so that I do not mind.

10118. You would not have intentionally hurt the feelings of any one member of this Committee, would you?—Not at all, but you are not so sensitive, I am quite sure, as to let your feelings be hurt by anything I have said.

10119. However, you spoke of the large profits of the middleman?—Yes.

10120. Then you referred to the fact of your being a shareholder in a dairy company, and that, therefore, you occupied to that extent the place of the middleman?—Yes, I do.

10121. Then I think you went on to say that the profits were 6 per cent.?—Yes, at present. But I do not want to go into the question of the past history of the particular society that I have the honour of having a few shares in, of course.

10122. But the past history would show us that the profits were much less than at the present time?—There was a very good reason for it, but I do not want to discuss that. This is not the place for it.

10123. Are you aware that although that company may perhaps have exceptional reasons why they do not pay more than 6 per cent., a great many other dairy companies in London do not pay more than 6 per cent.?—I do not know that they do not, and I do not know why they do not. That is all.

10124. Do you know the West London Dairy Company do not pay more than 6 per cent.?—No.

10125. Do you know the Belgravia Dairy pay more that 6 per cent.?—You had better put these statistics on paper, because I cannot answer your questions at all. Welford, I believe, pays 12 per cent.

10126. I ask you these questions because you have said that the profits of the middleman are exorbitant, and arrived at by crushing the dairy farmer, or giving him very low prices?—I believe they would be very much higher if they would behave more justly to the dairy farmer, and give him better prices, and deal in a little more liberal way with him. They would get very much better milk from him, and they would be doing themselves good as well as the dairy farmer, because the dairy farmer looks upon them with the greatest jealousy, and I am quite sure that if they were treated differently, and were offered some sort of premium for supplying good milk, both the purveyor and the dairy farmer would be all the better for it. I know I would not sell my milk at the prices the farmers near me are selling it at, and I know I get better prices for my milk, because people know it is genuine, and that there is no tampering with it.

10127. Are you aware that the Dairy Supply Company, which is the largest dairy company in the kingdom, so far as the turnover of milk is concerned, have a profit of only 3¾ per cent.?—I do not know anything about it, except only that one or two gentlemen connected with it seem to be very well off.

10128. Would you think that an exorbitant profit?—Oh dear no. I wish I could get it all the same.

10129. You said then that if you had visited this farm to which Mr. Farmer referred you would probably have discovered the reason for the poor milk inasmuch as the land might be perhaps of very inferior quality?—Yes, I suggested that as a possible reason.

10130. Then in that case would you suggest that that land should not be called upon to supply milk with 3·25 of butter fat?—Certainly, I should not. If I supply wheat why should I be allowed to supply bad wheat. If my land will not grow good wheat I must grow something else, and, if I could not give milk up to the milk standard I should have to do something else with it. I should not tone down the other land to the quality of bad farmers' land.

10131. You would eliminate that milk?—Yes, if necessary.

10132. And the same with inferior cows?—Yes, the same with inferior cows.

10133. You have not considered, and you have no facts, at least, you have some facts perhaps, but not sufficient to form an opinion as to the number of cows that would be eliminated?—No, I cannot tell you that. But if it was half of the herd I would do it. If it was half my herd that had to be eliminated I should fatten some of them, and sell them, and get better if I could.

10134. So far as your testing is concerned, have you found it necessary to eliminate about 15 per cent. on the one test you have already taken in the various groups?—About 1-6 is what I eliminated.

10135. Then you also think that an intelligent farmer would not be or might not be able to work up to this 3·25?—The intelligence of farmers is——

10136. Is not a fixed quantity?—I have no common measure for it. I do not quite know where it begins or where it ends, but I know the farmer generally is a man with a certain amount of sharpness, and if he saw his own way to get a better price for better milk, I am quite certain that even a second-rate farmer would do his best, and would probably achieve the very low percentage I have advocated. I am quite sure of it.

10137. Then, you say it would be quite impossible if inferior milk were made to tone it up by the farmer, and that the middleman could tone it up?—Certainly, the middleman can tone it up by adding good milk to it; but the common farmer cannot do it because if he takes away the cream from one lot, and adds it to another you detect it at once in the proportion of solids.

10138. (*Professor Thorpe.*) But he could take away a certain proportion of poor milk?—Yes, of course he could if his remainder was good milk.

10139. (*Mr. Barham.*) You say the farmer cannot tone it up when he produces poor milk, but are you aware that nearly the whole of the milk that is sent to the large towns is bought and sold under a warranty?—No, I do not know that at all.

10140. And that in that case the farmer, therefore, would be responsible for it till it reached the public analyst?—It depends, but, of course, I do not know enough about it. I do not know what the warranty is, and I should like to see the warranty very much. It is very hard on the farmer if so.

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10141. But if the farmer produces poor milk he has to accept the responsibility of it, if he has given a warranty?—It depends upon whom he sends it to. Supposing a dealer in London has twenty farms that send him up milk, they can analyse that milk, and say to this farmer or that you are sending me very poor milk. I will send it back to you or you must pay forfeit—pay a fine or whatever it is. Of course, the dealer could do that because the farmer is entirely in his hands. The quality of the milk at present is only guaranteed by the farmer in a very indifferent way really. All he can say is, I send you the product of my cows, and I do not take anything from it. You have got to buy the milk from me as it stands. That is all you can say about it. If you insist on the better standard, and condescend to pay him a better price, you will get better milk directly.

10142. You say your experience is very small?—Yes.

10143. And the experience of others before us is very large. Mr. Droop Richmond was here yesterday. Did you hear him?—I was here the day before for a short time, or for an hour and a half perhaps.

10144. He suggested that the standard for butter fat in milk during the months of May and June should be 2·8?—I was astonished.

10145. Would you in that case prefer to accept his standard to your own?—No, I certainly would not. I attach very little importance to my own opinion except just as far as any facts I can bring before you may influence you, but as far as Mr. Droop Richmond's very elaborate examination went I listened to it, but I confess I felt that Mr. Droop Richmond represents a particular and very important company in London, and that, of course, it was the business of the company and of all the persons who distribute milk in London to lower the standard as well as they can, and I thought he was giving his evidence very cleverly. No doubt his figures militated against his argument, but that does not much matter. The argument, no doubt, otherwise was in favour of lowering the standard, but it did not alter my opinion the least in the world as far as that goes. But that is only an opinion of my own, and it is not more than anybody else's, and you can just apply it as you like.

10146. With regard to the averages of the Canadian factory, you did not at the same time get the minima of fats of the milk supplied, did you?—No; but I gave you the averages in certain cases. In some cases there were millions of pounds of milk, and the average was up very high, such as up to 4 and 3·8 and 3·7. I did not think that you could suppose that the number of cases that would fall below 3·25 would be so numerous as to be really worth considering. In all mathematical calculations for getting averages you have got, after getting the law to reject the very highest and the lowest, and you take all the others, and if you did that only to a very slight extent with the figures I have given you I am quite sure you would find the average number of cases that would fall below 3·25 would be microscopic.

10147. But you have not the number of minima?—I think I have got them, but I cannot give them to you just now.

10148. Then you say that in many of the States, the standard for butter fat is 3 per cent.?—In lots of them.

10149. Did you get it there with some purity?—You could get it there out of a dozen books. In some of them I think it is 3·7, and there are one or two others at 3·5; but the majority I know are 3.

10150. Then you talked about toning up and altering the quality of the milk after the town purveyor receives it. Were you present when Mr. Droop Richmond said that it was not the practice to mark that butter off in the various churns of milk previous to sale?—Not in the various churns; but if he mixed the churns from one farm, or a certain number of them together, nothing would be easier than to do it, except that there is that fundamental difficulty which you know better than I do, and know how to cure much better than I do the proper sampling of such milk. There is a difficulty really in that, I allow. It is very easy to sample a small quantity for a Babcock machine, but a large quantity is different; but still I don't see any difficulty about it with the staff that there ought to be at the Aylesbury Dairy Company. They ought to be able to do that without great difficulty.

10151. But do you not think Mr. Droop Richmond's

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opinion upon that is conclusive?—I take it *cum grano salis.* He is a gentleman with knowledge, and he has written a book; and when a man has done that he must be a very distinguished person. I have written a book, but it was not upon milk.

10152. You spoke of milking at twelve and twelve hours, and do not you think that in many cases they are obliged to regulate their hours of milking by the time that the train leaves their particular station?—Of course, that is so, and that is one of the difficulties of the milk trade altogether.

10153. Then you do not anticipate that the Great Western or any other company would put on special trains?—They do put on special trains now.

10154. But they would not alter the times of them to suit convenience?—No. You can always get your morning's milk into the train with eight or nine miles to go to the station that the train goes from in the morning. The train is regulated for that.

10155. But evenings and Sundays are the difficulty?—And other days, too, as far as I have seen it. I, unfortunately, have to drive to my neighbouring town, and I used to have very great difficulty in dark nights with the number of milk carts that came galloping along. I do not think they ever find any difficulty in getting their milk to the city.

10156. But all over the country milk comes from greater distances than in Wiltshire?—Yes; and if so you have difficulties to deal with, and the farmers labour under disadvantages; but all these farmers ought to make cheese and butter with their milk, and fatten up pigs and that sort of business.

10157. Then you say if you fixed standards you would have the inferior standard of 3·25?—Yes.

10158. And a higher standard for what you call prime milk?—Yes. I should put a low standard for the prime milk because I rather want to encourage the public to appreciate it, and the people who deal in milk to feel it is worth their while getting a higher price and supply the public with a superior quality of milk. I believe myself firmly it would be better for the public and for the purveyor and the dairyman.

10159. You, perhaps, do not know that at present in some cases the town dairyman gives as much as 4d. a barn gallon more for what you term prime milk with 4 per cent. of butter fat?—I am quite aware of that; but if you pay 4d. a gallon more and sell it at 4d. a quart to the public, a very small addition to the present price would give very good remuneration. If you put on another penny to the public they will not mind if they get really good milk. If you give them choice of a very good quality of milk, they will willingly pay more for it.

10160. Now, supposing this Committee recommended the Board of Agriculture to fix the standard, and the Board of Agriculture acts upon it, you would not consider that an immovable standard or definitely fixed standard that could not be deviated from. You would leave it to the sanitary inspector or the chairman of the Sanitary Committee to use his own discretion whether he would prosecute or not?—No; not absolutely that. I should say let that be the standard to which all milk ought to come, and that all milk sold in the market ought to reach that standard, and any milk below that standard ought to be so designated and be sold cheaper. I do not at all want to prevent people selling milk at 3 per cent. or 2·8 per cent. if they like; only if they do, I say it must be stated to be such, and not be estimated at the same value and as being of the same quality of milk as the standard. Then I say the same in regard to prime milk. That would be sold at a higher price. But if you cannot lay down a second fixed standard it would have to be recognised as a sort of honorary trade mark: but the other, I think, ought to be a fixed standard, which should never be deviated from except in very particular cases coming before the magistrates. The magistrate is the person who would have to settle it ultimately. I know of cases in which there is long drought or a long spell of wet in spring, or other particular circumstances in a neighbourhood which would justify it, and I should tell the inspector to be cautious to send up only flagrant cases. An analysis would be made of the cases, and he would select those that ought to be prosecuted, and let slide those that were very near the standard.

10161. Then you would not forbid the sale of milk with 2·7, but designate it as thirds?—I should not prevent it being sold; but I should have an analysis of it and determine whether it was pure milk or milk with cream taken off it. I should take very good care that it was not sold as standard milk.

10162. So in that case you would like to have three grades of milk?—No. I should not have three, but two, and all above or all below.

10163. (*Chairman.*) You were talking about adulteration of milk in transit in the railway cars; but perhaps you did not know that the railway companies had made a pronouncement of the subject which is rather important. On the 12th October last year Sir Henry Oakley, on behalf of the Railway Companies' Association, wrote to say, "The railway companies have considered the question, and I am requested to inform you that with reference to the statement made in the letter from the Board of Agriculture, that senders have for a long time been allowed to send milk in sealed cans, the companies accept the declaration of the senders as to the quantity conveyed, no extra charge being made; the only condition the companies require to be fulfilled is that the tare weight of the cans shall be stamped upon the outside of the can, so that in case of doubt the quantity of milk within the churn can be approximately ascertained by allowing $10\frac{1}{4}$lbs. for each gallon of milk declared. It does not appear to the companies that there is any difficulty in the senders protecting themselves against alleged loss of milk in transit by sealing, padlocking, or otherwise fastening their cans"?—Quite so. There is no difficulty if you do that. If the churns pass through the hands of the weights and measures inspector, he could make it safe for the railway by stamping the churns.

10164. Is there any difficulty about that?—There is, I think. We have tried to do it down in the country, and we cannot touch it. They say the County Council in London are the only people who can do it or the County Council of Middlesex can do it, but we cannot do it down there, for we have no right to touch these cans, as they are owned in London. We can, I believe, examine the contents of them to see what sort of milk is in them. Our weights and measures inspector is very anxious to do it, but he cannot do it yet. There is no mark on them, and he cannot do it.

10165. (*Professor Thorpe.*) I just want to ask one question more. You have been asked one or two questions respecting evidence tendered by Mr. Droop Richmond. Here is a table handed handed in by Mr. Droop Richmond, showing the results of the analyses of milk for six years between 1894 and 1899 inclusive, and it is upon certain aspects of that table that I want to ask you a question about it. The number of milks examined was 76,058 samples. Now is it the fact, or are you able to corroborate the statement that the greater part of this milk, to speak generally, that goes to the Aylesbury Dairy Company comes from Wiltshire, or from the West of England?—I fancy it comes from Wiltshire and Berkshire, and I suppose some little quantity may come from Gloucester and Oxford, and I suppose from Buckinghamshire—I should think so. I think that is about the area they cover, but I don't know. Of course I am not in the secrets of that society.

10166. It appears from this table that the aggregate number of the samples of milk during those six years, which showed 3 per cent. of fat, was 768. That is one per cent. upon the total number?—Yes.

10167. The number which was at the limit of 3·2 per cent. of fat during the whole of that time was 2,568, or, in other words, 3·4 per cent.?—Yes.

10168. Does that coincide with your experience of what Wiltshire and those other counties could produce?—Most distinctly, it bears out every word of what I have said, I think.

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Mr. Charles Theodore Lehmann, called; and Examined.

10169. (*Professor Thorpe.*) You represent, I understand, the Condensed Milk Defence Association?—Yes.

10170. Would you kindly tell the Committee something about that Association?—That Association was started with a view of enlightening the public as to the exact value of machine skimmed condensed milk. The members of the Condensed Milk Association are practically all the manufacturers of machine skimmed condensed milk. Some of us manufacture whole cream condensed milk, but the bulk of it is machine skimmed milk.

10171. (*Chairman.*) In Europe?—Yes.

10172. That would be Holland, Germany, and Ireland?—Yes.

10173. Those three countries?—Yes. Italy manufactures a small quantity of machine skimmed condensed milk, but it is practically insignificant. There was at one time, and there are still a great many paragraphs published in the newspapers quite erroneously stating that machine skimmed milk is worse than valueless as an article of food, and in many cases manufactured from chalk and water, or that there is anything in it but milk, and it was with a view to stating the proper facts of the case that we got up this Association as the best way of dealing with the public. The efforts of one firm are often unavailing, and people are tempted to think it is due to self advertisement.

10174. (*Mr. Barham.*) I take it you represent the Condensed Machine-Skimmed Milk Defence Association; is that so?—Not alone. The original object of the Association was not to restrict itself to machine skimmed milk, but as that has been chiefly attacked, the evidence has been chiefly on those lines.

10175. (*Professor Thorpe.*) Then I gather that you are appearing in the interests of the importers of milk?—No, the manufacturers.

10176. Some of whom live in the country as manufacturers?—Yes.

10177. You condense machine skimmed milk?—Exactly, machine skimmed milk.

10178. Could you give the Committee any idea of the relative proportion of imported condensed milk and home manufactured condensed milk?—Condensed milk, or condensed machine skimmed milk?

10179. No. I will take you first on the whole thing. Could you, first of all, tell us what proportion of the trade is import trade, and what proportion of the trade is home trade?—I should say, fully nine-tenths of the trade was imported, I should think so, but I have not the figures before me.

10180. But that is your impression?—That is my impression.

10181. I forgot to ask you, but you are deputed by this Association to represent them, are you not?—Yes.

10182. How is the Association managed; has it a Council?—Yes, it has a Committee, which is practically formed by all the heads of the manufacturing firms.

10183. That Committee in view of this enquiry met, and deputed you to give evidence on their behalf, did it?—That Committee, in view of the enquiry that was about to be held, decided that if possible one member from each country, one firm, or one gentleman representing each country importing milk and manufacturing milk, should give evidence before the Committee, and I believe application was made by the secretary of the Association that you should hear one representing each country, but as only one witness was accepted, the Committee asked me to come and represent them as I represent the largest interests in that trade, my firm doing by a long way the largest trade in that particular article of commerce.

10184. What is the name of your firm?—R. Lehmann and Company.

10185. Then we may take it that R. Lehmann and Company are the largest importers of condensed milk?—Of machine skimmed milk.

10186. I will come to that, but they are, speaking generally, the largest importers of condensed milk?—Well, I should hardly like to say we are the largest importers of condensed milk. I should say of machine skimmed milk.

10187. May I ask if you are deputed to speak in the name of the Association, or are you representing yourself, or your own firm?—I do not know that there was any actual resolution passed that I should speak in the name of the Association. When the reply was received, that only one witness would be heard, they said that I had better come and represent them, but I have had no other mandate from the Association than that, and my evidence relates solely to our portion of the trade. I am unable to speak of the manufacture of milk in Germany, or in Ireland. I have not manufactured milk there, and I know nothing about it. I can, therefore, only speak of Holland.

10188. Then we may take it that you only represent your own firm?—No, I represent the manufacturers of condensed milk of Holland, you may take it.

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10189. Very well, if you put it in that way I do not object, but you represent the importers of machine-skimmed milk from Holland?—From Holland.

10190. Is the whole of that trade in your hands?—No; there are two other firms in that trade.

10191. What proportion of that trade, may I ask, if you do not mind answering that question, do you handle?—We should represent two-thirds, I think.

10192. You represent two-thirds of the importations of machine-skimmed milk from Holland into this country?—Yes, from Holland into this country. It might almost be taken from Holland and Italy. We represent two-thirds of the importation into this country of machine-skimmed condensed milk. The other milk manufactured in Germany and in Italy is very small; it would hardly affect the proportions.

10193. The greater proportion of what you yourself import comes from Holland, does it?—All that we import comes from Holland, and taking the total imports of machine-skimmed condensed milk into Great Britain, you would find that it is, I should say, equal to nine-tenths made in Holland, and that we represent two-thirds of those nine-tenths.

10194. Now, are you the head of your firm, may I ask?—No, my father is the head of the firm; but he has unfortunately overworked himself, and he is practically out of the business, although I hope not for long, but he has been out of it for the last eight or nine months, otherwise he would have been delighted to give evidence himself. I take leave to represent him as well as I can.

10195. Your firm, I understand, has been in the condensed milk industry for the last twenty years?—Yes.

10196. You have now three factories?—Yes.

10197. Those factories are in Holland, I suppose?—Yes, in Holland. There is one in South Holland, near Rotterdam, one in North Holland, near Amsterdam, and one in Friesland, so as to cover as large an area as possible near Harlingen.

10198. And you employ a large number of people in the industry?—Yes. Would you allow me to read this.

10199. No, if you will allow me I will ask questions. You deal with a milk supply of something like 25,000 gallons a day?—Yes, that is something about the quantity.

10200. To obtain this quantity you contract with a large number?—Yes.

10201. How many?—It is about 900 or just over 900 farmers.

10202. And these farmers are spread over, I presume, all the districts that you have enumerated?—Yes.

10203. In about equal proportion are they?—Yes, in about equal proportions.

10204. Which of the three factories is the largest?—There is not much difference between the three. It may vary at different times of the year, according to the prices of the milk in their different districts.

10205. Now, I believe you are prepared to give the Committee some analytical results which show the general character of the milk you obtain from those various collecting areas?—Yes, I have drawn up for that purpose two diagrams or curves, as I thought that was the easiest way to show it. These reports, or analyses, that I have taken here represent the last four years. We have made them for the last twenty years, but fifteen years of them were destroyed previously, and I have been only able to give you the last four years. Of course, these represent a large number of analyses. I suppose about 15,000 per annum, as the number of analyses that we take. This diagram—(*producing the same*)—will show the average maxima and minima of percentage of fat in the last four years. I have coloured the three different districts showing the curves in three different colours, black, red, and green, so that it should be easy to trace them.

10206. (*Chairman.*) Is that with regard to the machine skimmed milk?—No, in full cream milk.

10207. (*Professor Thorpe.*) But you told us that was only 5 per cent. of your output?—Yes.

10208. Therefore, that is an infinitesimal proportion almost?—I should have led up to that by saying, of course, that dealing with a large number of farmers, as somebody has said, they are not all honest, and we

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have naturally to examine the milk as we receive it, to see whether they are cheating us or not. Although we make machine skimmed milk, still we manufacture large quantities of butter, and the percentage of butter fat in the milk is a very important element.

10209. (*Chairman.*) That is from the bye-product, as it were, that you make condensed milk?—It is from the bye product that we make condensed milk—the machine-skimmed milk.

10210. (*Professor Thorpe.*) You buy the whole milk?—We buy the whole milk.

10211. And you make butter?—We make butter and machine-skimmed milk.

10212. In other words you convert the fat which you separate into butter, and the residue you condense and sell as machine-skimmed milk?—Yes, the residue we condense, and sell as machine-skimmed milk. Now, at one time we started in a very small way with payment by results, or payment by our percentage of butter, but as things went on our trade increased, and we found we could not keep it up. It led to continual dispute, as the farmers alleged that it was to our own interest to make the percentage of butter fat as low as possible, so as to pay them little for the milk. We therefore gave up payment by results and substituted so much per volume of milk, but we analyse a certain number of samples amongst the milk, and any milk that is below the standard we reject, or fine the farmer if it is clear case of fraud, so that we practically keep it up to a fair standard. Then for each farmer we keep records of the milk he supplies, and it is analysed, of course, and should we find one particular farmer supplies milk of generally poor quality we do not renew our contract with him, and if there is no improvement we throw over the farmer.

10213. Formerly you paid by results?—Yes.

10214. You have abandoned that now, and you make contracts with your farmers?—We make contracts with our farmers now.

10215. Do you name in your contract any specific amount of fat which the milk delivered to you shall contain?—No, we simply state that the milk must be full cream.

10216. What guarantee have you that it is so?—We have no guarantee but our own check.

10217. In other words, you are content to take and to pass a certain minimum quantity of fat which you yourselves determine?—Which we ourselves determine.

10218. You refuse to buy the milk, in fact, if it does not reach a certain standard which you determine?—Yes.

10219. What is the standard you determine on?—The standard we fix on is determined by the average quality of the milk for the particular time of the year and that month, and to a certain extent by the particular district. We do not send out to our farmers and say that this time of the year milk shall be 3 or 2·75 or 2·50 per cent., because that would be encouraging a man to take a little cream off if he were clever enough—and I do not think many of them are clever enough to find out the percentage of butter-fat. We know the percentage of butter-fat varies immensely with the district and time of the year, and so on.

10220. How do you work this contract, if you do not mind telling us that?—Taking the time of the year to be, say, January, 1896, in the South Holland district, I find the butter-fat is 3·41 perhaps.

10221. What do the curves represent?—The three districts. South Holland is represented by the black, North Holland by the red, and Friesland by the green. South Holland was only started in November, 1896.

10222. Beginning with the black and red curves, let us trace those out. Do you find that in the month of January, or between January and February, in both those districts the amount of butter-fat varies from 3·4 to 3·5 per cent.?—Yes, from 3·4 to 3·5 per cent.—these are the figures.

10223. Then, on the whole, it steadily diminishes, until in the case of the South Holland milk it reaches in the month of July, or, rather, between July and August, the figure you give there. These are the mean positions, so to say?—Yes, these are the mean positions.

10224. Half way between July and August, or the end of July, rather, it reaches its minimum of 2·75?—Yes, I think that is the figure. I have them down here.

10225. It reaches in that particular month 2·75?—Yes.

10226. That is in the case of the South Holland milk?—Yes.

10227. In the case of the Friesland milk it drops down to about—what shall I say—2·8?—Yes, 2·8 is the lowest.

10228. It never gets below that?—No, practically not.

10229. That is in this month between May and June in this particular year?—Yes, between May and June in this particular year.

10230. After which it steadily rises again in both cases?—Yes, in both cases.

10231. And it reaches in the case of the Friesland milk to a maximum of 3·71?—3·71.

10232. Which is some time between October and November?—Yes.

10233. In the case of the North or the South Holland milk, it reaches its maximum sometime later—namely, about the end of November?—Yes.

10234. Its maximum being 3·63?—Yes.

10235. After which in both cases, both in Friesland and in South Holland, it begins again steadily to sink and reach the second minimum at about substantially the same period of the year as the previous case?—Yes, as in the previous case. It is always confined from year to year substantially to the same period. There may be little variations, but it is substantially the same.

10236. The curves are fairly symmetrical, I see?—Yes, fairly symmetrical.

10237. They are not only symmetrical, but they are fairly concordant?—Yes, fairly concordant.

10238. So that we may take it they reach their minima respectively—when?—The average of the minima would be probably in June. The worst months are always April, May, June, and July.

10239. Very much the same period of time that they reach their minima with us?—Sometimes in June.

10240. They reach their minima in the spring months of the year, as in this country?—Yes.

10241. And they reach their maxima also in the late autumn, as here?—Yes. We get the maxima between September and December, here they are November and December. Here there is October, November, and December, otherwise they are all November and December.

10242. The range we may summarise in this way. The minima are in these particular months of the year and the maxima are in the fall of the year in all cases?—Yes.

10243. And they range to about, we may say, on the average 2·6?—2·35 is the actual minima.

10244. But that is so obviously an exceptional case. It is out and beyond anything else?—I do not know that. It is an average on the samples.

10245. Yes, but there obviously must have been here—it stands to reason from the nature of the curves—some climatic difference?—Yes, there is some climatic difference, but they are all fairly low that year. Unfortunately I have not got the two months for the Friesland factory. There is no return there, so that I had to make a gap.

10246. But that is a striking exception?—That is a striking exception.

10247. Which is obviously abnormal?—Yes.

10248. But with that exception the minima are fairly uniform?—The minima are fairly uniform.

10249. The average minima is about 2½?—About 2·50 would be the average minima.

10250. This is above a little and below a little?—But still I wish to point out that it is not the absolute minima of one case, but it shows the whole south district as being very poor for that year: I do not say it is so always, but it is possible for genuine milk in certain years to fall to a very low minimum. That is what I wish to point out.

10251. What we want for the moment to get at is the actual normal fluctuation?—Yes, and my object in showing these three different fluctuations is to show that you cannot even take an average for one particular country. In Holland you get it according to the different districts. South Holland is somewhat wetter than North Holland or Friesland.

10252. (*Chairman.*) I presume these figures refer to Dutch cows?—Yes, to Dutch cows.

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10253. (*Professor Thorpe.*) But after all, this is a somewhat exceptional case, and it is not fair to take it as indicative of the general character?—No, that is all I wish to say.

10254. I do not wish to lay too great stress on that maximum?—And I simply show this as what actually happens.

10255. Now, may I draw your attention to this, that although in this particular case of North Holland in this particular year for some reason which does not immediately appear, there is on the average so low a proportion of fat as 2·35, yet, on the other hand, for South Holland in the following year, in December, there is as high a proportion as what?—In South Holland 3·88 is the figure.

10256. You wish to imply that there is a considerable fluctuation in the fat for that milk?—Yes.

10257. But on the whole that is fairly regular?—On the whole that is a fairly regular fluctuation. As you see, it is very low during the spring months, and it goes very high comparatively speaking during the fall of the year—October, November, and December—and I think that is so in most countries.

10258. We may also gather, too, that there is no obvious influence of locality, because the curves cross and recross one another?—This North Holland one is generally a lower curve. It does not rise to the same maximum as the other curves, and it falls below in the minimum points.

10259. But it crosses in some periods of the year, and is rather higher at some others—it crosses and recrosses the curve?—Yes, with a general tendency, I think, to be lower.

10260. Here again it is distinctly higher than *that*? Yes.

10261. And they cross and re-cross one another?—Yes.

10262. So that, I think, one is justified in drawing the inference that, although there may be slight differences in the amount of fat in the Dutch milk, depending upon districts, upon the whole year, taking the whole year round, the amounts of fat yielded by the Dutch cow placed in different parts of Holland are substantially very similar?—Yes. Of course, it is always possible to have an average, but I have given you these extreme curves, leaving it to you to draw your own conclusions as to the actual average curve.

10263. I think the curves bring out graphically and very strikingly that general fact?—Yes. It seemed to me better than this general table (producing same), which shows the same thing in another form.

10264. Now do these curves indicate to you that Dutch milk, speaking of it on the whole, is poorer in fat than milk of any other country?—I cannot say that I have actual knowledge of the milk of other countries. I believe that this is somewhat less in fat than that of Swiss cows, I think, and Norwegian cows.

10265. You believe that Dutch milk is generally poorer in fat?—Poorer in fat—I should say it was, but I have not a comparative curve like this of the milks from Ireland, or England, or Holland, or Norway, or Switzerland, and I cannot give a definite pronouncement. I should have to consider it further.

10266. You have had some correspondence with the Board of Agriculture on some matters connected with samples of your milk, I believe?—Yes.

10267. And you put forward the statement that Dutch milk is generally poorer in fat than the milk of other countries?—Yes, I think so.

10268. Now I gather from you that that is not so?—This is what I say, that, generally, I believe it is principally poorer in fat, but as to giving figures I could not do it. I said just now, as I think I said before, that it is poorer than Swiss and Norwegian cows' milk. That I fully admit in my evidence, but I do not know as to English and Irish cows. I have no figures for those.

10269. Would you go so far as to say that the milk of Dutch cows is poorer in fat than any other European milk?—I do not know. The Normandy cows would certainly be better, but I know nothing about Danish, or Italian, or Austrian cows.

10270. Are you of opinion that it would be poorer in fat than English cows' milk?—I do not know. I have heard this morning some figures given as to English cows, but I have no means of testing their correctness, but if the figures that I heard this morning are correct, it would be evidently poorer.

10271. The greater number of brands of milk that you import of your manufacture are from skimmed milk, are they not?—Machine-skimmed milk.

10272. Do you send into this country any sample of whole milk condensed?—Full cream milk?

10273. Yes?—Yes.

10274. What are the particular brands under which you designate it?—Milkman, Mother, Popular, and Hollandia.

10275. Those contain whole milk?—Yes.

10276. No others?—Not under our own labels, but we supply milk under special labels for various firms as whole and machine-skimmed milk.

10277. Those are, I believe, all sweetened condensed milks?—They are all sweetened condensed milks.

10278. Do you do a trade in any other?—Yes, we manufacture unsweetened condensed milk as well.

10279. In Holland?—Yes.

10280. What are the names of that?—The Hope Brand.

10281. Any other?—That is the only one that we import.

10282. That is the only unsweetened condensed milk you deal in?—Yes.

10283. Is it a whole milk?—That is a whole milk.

10284. Do you in any way guarantee to the persons that you sell these whole condensed milks to any definite proportion of fat?—No, we simply guarantee the milk as being made from pure full cream condensed milk without any abstraction of its fat. So that it would be practically impossible for us to guarantee any definite proportion of fat, as we do not ourselves know about that. We can, of course, trace it; but it would be very difficult to trace in each particular instance what the proportion of the fat has been in the condensed milk, in the whole milk imported and condensed.

10285. In the process of condensation you start with an initial relatively large volume of milk, I suppose?—Yes.

10286. Do you determine the amount of fat which that initial volume of milk contains—the percentage amount of fat?—No, we do not. If I may explain, when the milk arrives at the factories in the morning the works manager of that department has instructions to put so much milk apart for separating and for condensing as machine-skimmed condensed milk, and so much of it will have to go to full cream. Those churns which are for the whole cream milk go direct from the receiving depôt into the receiving rooms, whereas those that have to be machine-skimmed pass up to another floor and have to go down to the separators and are separated, the cream being put on one side and the machine-skimmed milk, after having been through the separators, is pumped up to the cooking pans or the vacuum pans in another room, so that there is no possibility of the two, the full cream home milk and the machine-skimmed milk, getting mixed. I have full cream or machine-skimmed milk.

10287. Yes. Could you tell the Committee what degree of condensation you condensed the milk to—how many times its initial volume?—That varies a good deal, according to the time of year the milk is condensed, whether it is condensed for immediate consumption or for keeping if it is for export or home trade, and if it is full cream or machine-skimmed milk.

10288. What circumstances lead you to condense it sometimes to a greater extent and sometimes to a less?—I have just explained. It depends upon what is going to be done with the milk. May I enquire are the answers I am giving going to be published or are they confidential, because these things are more or less trade secrets?

10289. Of course, the evidence will be published, but I do not wish to press you on anything which is in the nature of a trade secret. You come here voluntarily, I presume?—Yes, but the point is this, that everybody cannot make machine-skimmed milk. Everybody cannot make milk for export. It is a question of degree, and the condensation percentages of sugar and one or two little things like that. That is the whole secret of the trade.

10290. But those are milks (and you will forgive me for speaking about it out of the depths of my ignorance) which are condensed, and which are sterilised naturally in the course of condensation?—As a matter of fact they are sterilised first.

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10291. But in any case they become sterilised?—There is double sterilisation.

10292. Incidentally they must be sterilised?—Yes.

10293. And they are further preserved, if that be necessary, by the addition of sugar?—Yes.

10294. Now, I will not press you on this if you decline to answer, but what is it that determines the degree of condensation of the milk. Is it the ultimate price that you are going to get for it, or what is it?—No, that is nothing at all to do with it, because with milk substantially they always condense it to about the same. The price does not vary with a particular sample. Milk is not like butter, that you can go and offer in the open market, which one can go and sample. Condensed milk is sold on its merits according to the label—that is to say, a certain label gets to have a certain value in the market, and I have one here, a cross brand, for which we can get 1s. a case more than we can for another milk exactly the same quality under a different label, and that is simply because the public has got to like the label. That is, of course, the whole secret of a proprietary article. Taking pills, Beecham may get more for his than a chemist making the same thing in his own shop.

10295. All these are facts we should know something about, because we have to determine the limits in connection with condensed milk, and we desire to know from you, as a manufacturer of these articles, and to get information which shall guide us in the definition of such limits?—Quite so.

10296. Therefore, excuse me saying that it is perfectly germane to ask what are the circumstances which lead you sometimes to condense the milk to a greater extent than at other times?—Yes, and I am quite willing to tell you that, only what I should not like to have published is the exact figures, because the variation is not great. The average is one quarter, but the actual yield might be 23 per cent., or 24, or 25, or 26, or 27. Take it as an average at 25 (*see foot-note**). It is determined, to a certain extent, in milk for export going to a hot climate, and that is subject to get thicker much more rapidly than milk in a cold climate, and, therefore, that has to be condensed slightly thinner than for home trade, which is very slightly different. Each can of milk which is freshly condensed is thinner in consistency than when it has stood for a week, or a month, or three months, or six months.

10297. To take you on that point, do you offer any explanation as to that?—No, I should be very glad if you could give me one. It is a matter which all condensed milk manufacturers would dearly love to have a valuable opinion on.

10298. I doubt if they could get a valuable opinion from me, but I wish to know, as a matter of information to myself, whether it is the tendency for the casein, the albuminoid portion of the milk, gradually to coagulate?—It would appear to be so.

10299. You have said that in hot countries, where the milk is subject to a higher temperature *in transitu* and also in keeping than with us, there is a tendency for thickening to take place?—Yes.

10300. It cannot be due to evaporation?—It cannot be due to evaporation.

10301. Therefore, presumably it is the effect of temperature upon the milk?—It is the effect of temperature upon the milk, and it has been suggested that it is the casein, but it is not, or we are not absolutely sure of it, and we should like to know how to prevent it.

10302. Does that take place to the same extent in an unsweetened as in a sweetened milk?—I have hardly had enough experience of unsweetened milk to tell you. It is not an article that we manufacture very largely—not in anything like the same proportions as the sweetened milk and machine skimmed milk. The supply of natural milk is far greater in summer than in winter, but the demand, on the contrary, is much greater in winter than in summer, and a good deal of milk has to be prepared in summer for consumption in winter, so that where we have big stocks we have to prepare a lot in summer for winter. With machine-skimmed milk the demand is much less, and we need not keep big stocks, because we can make at any time what is required should a small stock run out.

10303. I think you have led the Committee to believe, and you will correct me if I am wrong in this, because I want to be strictly accurate, that your contention is that Dutch milk is generally considerably poorer in fat and richer in casein than most other European milks. You have led us to believe that such is the case, is not that so?—It is comparatively so. I believe that if you take the ratio of solids not fat in Dutch milk to fat it would be greater than it is, I believe, in Normandy and Swiss milk.

10304. The analyses with which you have favoured us were made by yourself, were they?—No, none of these that I have got here were made by myself. They are all made at our laboratory in Holland.

10305. I mean by your employees—they are made by your own officers?—Yes, by my own people; but some I have here are not. They were taken by an analytical office in Holland, which is quite independent of us.

10306. What is the name of the office?—I shall remember it in a minute or two.*

10307. Do you mean a public official?—No, it is a private analyst, who has power to analyse at any time samples of either our milk or other people's milk. Most people in Holland have that arrangement in order to guarantee the public. In fact, we have it clearly provided that anybody may present samples of either milk or butter to a certain analyst, whom we designate and to whom we pay a certain fee for doing it, and have the genuineness of the sample tested. We do not know when they may be coming and what sample they may take up.

10308. That is somebody practically retained by you in Holland?—Exactly.

10309. And who is to examine such milks as may be brought by anybody to him?—As may be brought by anybody to them, so that if you saw a tin of our milk in Holland, and wished to see whether it was genuine or not, you could go to that analyst and have the sample examined free of charge.

10310. That is an analyst retained and paid by you?—Yes. Of course, he is not exclusively paid by us. He has business just as any other analyst has in London.

10311. Quite so, but he is retained in your interest?—Yes, and he charges so much afterwards.

10312. He is an expert official retained in your interest?—In the interests of the public as much, I should consider, as in ours.

10313. But the public has no choice in the selection—there he is, and you point to that particular person?—We point to that particular person, because we could not lay ourselves open to having samples come before anybody who charged fancy prices.

10314. (*Dr. Voelcker.*) Do you accept only his analyses? No, but we could not pay for it if you went to Tom, Dick, or Harry—a man who charged fifty guineas for his work.

10315. But you do not say you accept only his analyses?—No, not at all; but that is the only man we have a definite agreement with as to what he should charge us for analyses made for customers.

10316. (*Professor Thorpe.*) Has the gentleman you speak of his office in Rotterdam?—In Amsterdam.

10317. Do you know a Dr. Lam in Rotterdam, an analyst?—No.

10318. You do not know him as the official analyst in Rotterdam?—No. I should have nothing to do with him.

10319. You never heard his name?—I do not know his name at all.

10320. You are not, therefore, aware that he has published a considerable number of analyses of milk in Holland?—No, I have not seen them.

10321. It appears that during the year 1898 Dr. Lam has published a series of analyses of milk taken in Holland, presumably in the neighbourhood of Rotterdam. Is there anything exceptional about Rotterdam or in the neighbourhood as a milk-producing district?—It is a very large milk-producing district.

10322. It is?—Very large, certainly.

10323. Is there anything exceptional about it as a

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* The witness subsequently corrected this as follows:—"The average is one-third, but the actual yield might be 33 per cent., or 34, or 35, or 36, or 37. Take it as an average at 35."

* The witness subsequently wrote:—"The name is Harmens, Analyst to the Queen of Holland, by appointment."

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milk-producing district?—Exceptional in what way do you mean?

10324. I mean to say, is there anything that would cause the milk produced in the neighbourhood of Rotterdam to be different from that produced in other parts of Holland in any way?—You would have to be careful how you take Rotterdam. Certain parts of the neighbourhood of Rotterdam are exceedingly marshy districts. Some parts of it we will not accept milk from. Other parts again are in the neighbourhood of Schiedam, which is a large distillery centre with over 400 distilleries there, and the farmers use a great deal of the cake in feeding their cows. That we reject. So that in that case you have to be careful on which part of Rotterdam it is. We are very particular in that respect.

10325. There is perhaps something exceptional then in it?—Yes. If you take Rotterdam it is a district which ought to be divided into three, as I say. There is the district round Rotterdam which is under the influence of the Schiedam cake manufacturers, or alcohol manufacturers, but of course producing a lot of cake.

10326. (*Dr. Voelcker.*) Refuse, you mean?—Yes, distillers' grains and all that sort of thing—I should say grains are refuse.

10327. (*Professor Thorpe.*) That would give a relatively low quality of milk?—We do not like it because of the flavour. It always has a flavour.

10328. Would a cow fed on a considerable proportion of distillers' refuse give, as regards its butter fat, a rich or a low quality of milk?—I could not say about that. I am not a practical farmer.

10329. Now, will you be surprised to learn that from the results of a series of analyses made by Dr. Lam over the year 1898 it appears that the average total solid matter in the milk produced round about that district is about 12¼ per cent. of solid matter, of which the amount of fat is about 3·62?—Yes, I should.

10330. Would you be surprised to learn that that was the normal condition of things there?—Yes, I should say it is not normal.

10331. Do you know Dr. Van der Zande?—No, I do not know him.

10332. Do you know the agricultural station at Hoorn?—I know there is one, but I do not know it myself.

10333. Do you know Dr. Weismann, of the University of Leyden?—No, I do not know any of the public analysts of Holland.

10334. These gentlemen are not public analysts, but they are officials in the sense that they are Departmental or Government officials?—I do not know them.

10335. You are not aware that these gentlemen have made analyses of Dutch milk?—No.

10336. Would you be surprised to learn that these gentlemen do not bear out the contention that, on the whole, the quality of Dutch milk is, as regards its butter fat and the relative proportion of fat to casein, in any way different from any other European milk?—I should be very much surprised to hear it. I do not think it would be borne out by practical men in the trade. An average of 3·6, too, is I think very unusual.

10337. Certain of your products have been taken by the Customs and have been analysed in the Government Laboratory?—Yes.

10338. And, as a consequence of those analyses, I understand you have had correspondence with the Board of Customs and with the Board of Agriculture?—Yes.

10339. You sell one brand of milk which is called the "Mother" brand?—Yes.

10340. And it is stated on the label to be pure condensed milk, warranted to be prepared with the richest cows' milk, containing the whole of its cream and best refined sugar; and you further add that it is most wholesome for babies and children?—Yes, I daresay.

10341. That is an accurate statement of what is on your label?—Yes.

10342. Are you aware that that sample was reported from the Government Laboratory as having been impoverished by the removal of 15 per cent. of the fat which it ought normally to contain?—I had a report of that figure from the Board of Customs, and I asked them unavailingly to let me have a report of the analysis, as the statement that it was impoverished by 15 per cent. of its cream might depend on the standard that has been fixed. If the standard is fixed at 4 per cent. it would lead to a very different result than if the standard is fixed at 3 per cent. I had a sample of that same milk analysed by an analyst in London, and he gave the return as good milk. He said he would have no hesitation in declaring it to be full cream milk.

10343. There again, I suppose his judgment would be based upon the initial amount of fat which the milk should contain, would it not?—He would not know it; he would not know anything more than the sample that we gave him.

10344. He must have had some basis on which to make the deduction if it was whole milk?—Certainly, but what those bases are I cannot say.

10345. Assuming that the standard applied to this was the same as the standard applied to the milk which we ourselves drink in this country, would you consider yourself unjustly aspersed by that?—I should like to know exactly what the milk I drink in this country is.

10346. Supposing we take a standard of 3 per cent. of butter-fat, do you consider yourself hurt by the adoption of a similar standard for your produce of whole milk?—I should say we could not do it. We could not guarantee it during about four or five months in the year. Our normal milk containing all the cream would not reach a standard of 3 per cent. during about five months of the year.

10347. Your condensed milk which is produced by the mixing of a relatively large volume of milk starts from a product which more nearly approaches the average character of milk?—I do not quite follow you there.

10348. If it is produced from a relatively large volume of milk, of course the milk must be mixed?—Evidently.

10349. It must be the mixed product of many cows?—Yes.

10350. You say there are some 900 farmers that you deal with?—Yes.

10351. And the manufactories are three in number, and they are about equal in extent?—Yes.

10352. Therefore, you are operating on the mixed product of something like 200 farms?—Yes.

10353. You are therefore operating upon a product which must approximate more nearly to the average character of milk?—Just for that particular time.

10354. And for the particular district?—Yes.

10355. Adopting a basis of 3 per cent. of butter-fat in the milk it appears that that particular sample of "Mother" brand milk would show 15 per cent. less fat than it ought normally to contain?—That is to say you would make the butter-fat, how much?

10356. I have not the slightest hesitation in giving the actual results of the analysis to you if you wish to have them?—I should like to have them; we can say nothing until we have them.

10357. There is no hesitation in giving you that. It was a product which contained 7·84 per cent. of fat, the ash, that is, the saline matter, being 2·20 per cent., and the solids not fat being 66·04 per cent. The water was 26·12 per cent. The admixed cane sugar was 36·92 per cent. The milk solids not fat were 29·12 per cent. You sell another brand of milk, I believe, which, according to the label, is warranted to be prepared from whole milk, and which is known as the "Popular" brand, do you not?—Yes.

10358. Analyses have been made and published of that milk, have they not?—I believe some has been examined at Manchester, but I have not had any reply yet.

10359. Do you know of a public analyst of the name of Mr. Allen?—I do not know him.

10360. He has written a book entitled "Commercial Organic Analyses," in which he has given the results of a number of milk analyses. Are you aware that in that book it is stated that the amount of fat in that milk was 2½ per cent.?—I have not seen the book, and I know nothing about it.

10361. You are not aware of the fact that it stands in print that your "Popular" brand consists of condensed milk the fat in which is 2½ per cent.?—Of course, it might perfectly well be so at some particular time; 2·5 is certainly low, but I have figures that are as low as that at some particular time of the year.

10362. It is 2½ per cent. in the condensed milk?—Excuse me, what is the date of that Report; that makes all the difference? I may as well tell you that when we first brought out the "Popular" milk, we brought it out

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as machine-skimmed milk—or, at least, at the time with only partly-skimmed milk. That was some years ago. Since then we have improved the quality of it, and made it full cream milk, and the price has been correspondingly altered.

10363. That does not appear?—Of course, if the date of that were put in it would make all the difference. I have not by me the date when we made the change, but I could turn it up and find it out. It was some years ago.

10364. I may say that the Government Laboratory has made many efforts to get this new "Popular" brand by asking for it in various parts of London, but as yet it has not been successful?—I can easily give you addresses where they can get it.

10365. You told me you made an unsweetened milk called the "Hope" brand?—Yes.

10366. Is your "Hollandia" brand a sweetened or an unsweetened milk?—We have both. We used to make the "Hollandia" unsweetened milk, but that name has been changed to "Hope," as there was some confusion in having the same name for three different labels. Of the other two, one was what we call a full-sized tin, that is to say, an 18-ounce tin, and the other was a tin of 15 to 15¼ ounces. As we had these three different qualities or sizes of milk under the same label, it was thought advisable to change. We made the unsweetened the "Hope," and the full-sized sweetened we were going to call the "Angel" brand, but we find we cannot register that name, and therefore we shall have to change it again. We have kept the name "Hollandia" only for the smaller size of sweetened milk.

10367. Does your "Mother" brand milk, which you say is made from unskimmed milk, whole milk, and which you recommend for the sustenance of children, vary at all in composition?—Evidently.

10368. Does it vary widely in composition?—As widely as the milk itself.

10369. Only as widely as the milk itself?—Yes.

10370. Not more widely than the natural variation in the milk itself?—No, there is no reason why it should. Of course, in the actual condensed form there would be slight variations which would be due to the fact that it is practically impossible to condense your milk every time to absolutely the same degree; but those, of course, are small differences, as one always endeavours to condense the milk to the same standard. It is only because it is a commercial impossibility to do it that it is not done.

10371. Supposing that some other analysts find in another sample of the "Mother" brand only 5·6 per cent. of fat—I found as much as 7·84 per cent., and I certified on the result of that that it was still deficient to the extent of 15 per cent. of the fat which it ought normally to contain—if another analyst finds only 5·6 per cent. in the "Mother" brand, which is said to be from unskimmed milk, how do you account for that variation?—I should like to see it done over again. You, as an analyst, know that condensed milk is not one of the easiest things to analyse, and there is many an analyst who has gone wrong over an analysis of condensed milk. I have here an analysis in which 7·65 per cent. in condensed milk was passed in Holland as perfectly genuine. I do not know exactly how this 7·84 works out to the solids not fat. It of course depends on the degree of condensation, and I should have to work it out. I cannot say exactly how it was in the original milk.

10372. You send milks into other ports than into London, do'nt you?—Yes, practically into every port in the United Kingdom.

10373. You have shipped to every port in the United Kingdom?—To every port having communication with Holland.

10374. There was another milk which was received from Newcastle; the consignee was unknown at the time, but we subsequently found that you were the consignees?—I remember your inspector coming up, and I pointed out to him that if he had looked at the bill of lading he would have found the consignee. It was not a very difficult thing to find out.

10375. There was no brand on that?—I beg your pardon; if it is the sample referred to it was labelled "Mother Brand."

10376. On that occasion we, at all events, at the Laboratory, had nothing to indicate that it was the "Mother" brand, or that it was from your firm; we reported that it was impoverished to the extent of 20 per cent. of the fat which it ought to contain?—Of course, we can say nothing until we have the actual figures.

10377. The actual figures I will tell you—fat, 7·25; solids not fat, 65·43 (the cane sugar was 36·53); water, 27·32; ash, 2·12, the solids not fat proper to the milk being 28·9?—That is very much the same as the other.

10378. Slightly more dilute, is it not?—I cannot say that I accept your statement that it is diluted, because I am perfectly sure that we do not dilute our milk. If you work out how much it comes to in the original milk——

10379. We know exactly what it comes to in the original milk. The first one of which the abstraction was 15 per cent. on our basis of 3 per cent. had 2·6 of fat in the initial milk; in the second case which we got from Newcastle the amount of fat was only 2·4?—Of course, on a 3 per cent. basis that shows a deficiency.

10380. That allows of a large admixture of separated milk?—Yes, but, as I say, according to our figures these, though low results, are not absolutely impossible.

10381. The "Cow" brand is a machine-skimmed milk, is it not?—This is rather a difficult point. I went to the Board of Agriculture about it at the beginning of the year, but I failed to get any very decisive reply. Years ago, when machine-skimmed milk was first put on the market, some competitors of ours used to sell theirs—and they sell it now—as machine-skimmed, and it was machine-skimmed. We had some scruples on the point, and we used to sell it practically at the same price and retail it at the same price as partly-skimmed milk, which had about 20 to 30 per cent. of its cream left in. We did this for about three or four years—say three years—at a loss to ourselves, and I am sorry to say the public did not appreciate it in the least. So we had to come down to the same standard as other people, and to make fully-skimmed milk. I am referring to the days when milk was sold as skimmed, there being no distinction between separated, machine-skimmed, or otherwise. One of these brands was the "Cow" brand, and when we found it necessary to come down in quality, the "Cow" having a very good name, we decided not to change that, but to try and continue to sell it at its full price, leaving it its quality of a partly-skimmed milk, and reducing all other brands. We introduced another brand of about the same size of machine-skimmed milk, to sell at a competing price—of course, lower than the "Cow"—with that at which other people were selling. We have kept this "Cow" brand right up to the end of last year, selling a little less of it every year, but still, there being a larger profit on it we did not so much mind that, as the other brands were selling pretty freely. When the new Act came into force it gave no indication of what we should call this milk. We could not call it skimmed, because it was not entirely hand-skimmed milk, being made with a certain proportion of full cream milk, and to call it machine-skimmed milk would have been equally untrue, and we would have been depreciating the value of our milk. So we labelled it part full milk and part machine-skimmed milk, but I had recently—about Easter time—a visit from an Inspector of the Board of Agriculture, who said some samples of this had been seized at Harwich, and it was not considered to be according to the regulations.

10382. It was not labelled according to the regulations?—That is so.

10383. The regulation being what—that it should designate that it was impoverished?—No, I do not think the Act says anything about that. He acknowledged that there was no provision made at the time the Act was passed for this particular class of milk, and that there was some slight difficulty on the point. If we called it machine-skimmed we were certainly not stating what were the facts of the case. If we called it full cream we were equally wrong. If we called it skimmed we were technically wrong, because it was not hand-skimmed. So what we have decided now is to completely give up that quality and to make the milk a machine-skimmed milk, labelling it, of course, as machine-skimmed milk.

10384. The article itself, this "Cow" brand, contains about 2½ per cent. of fat?—It would contain about 2½ per cent. of fat condensed.

10385. We found in the Laboratory that a sample contained 2·56 per cent. of fat?—That would be about right.

10386. We stated that it had been prepared from milk which had been deprived of the greater portion of its fat or from machine-skimmed milk, to which a certain and relatively small amount of fresh milk had been added?

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—Yes, that is quite correct; that is exactly what was prepared.

10387. What have you done to this brand?—As I said, we are now calling it a machine-skimmed milk, and, of course, are skimming it entirely. It is not appreciated with having full cream milk in it, and we are making it a totally machine-skimmed milk and labelling it accordingly.

10388. Another sample of your importation was taken at Goole, and also at the time the consignee was not known?—Yes; also a case where the bill of lading should have been seen.

10389. It is so reported that the brand was not known, at all events, we never got anything to indicate what it was or from whom it came at the time. We found that this sample contained only nine-tenths of a per cent. of fat. We reported that this sample contained separated milk, and that it ought to be labelled in accordance with the Act, but that it was not so labelled?—I beg to differ; I have a label here; it was labelled machine-skimmed milk. I wrote to that effect to the Board of Customs; in fact, as soon as it came up I showed them the bill of lading of the goods, and showed them the actual tin, but I have received no reply as yet from the Board of Customs either acknowledging their mistake or pointing out ours (*handing in label*).

10390. You deal, of course, directly with the grocers?—Yes.

10391. Do you now supply them with labels?—If some of our customers prefer to have their milk labelled themselves we print the labels at our works and label the tins at the works. We should not supply our customers with labels and allow them to put them on themselves.

10392. Supposing a person goes into a grocer's shop and asks for one of your brands of milk it is handed to him over the counter; something suddenly strikes the seller of that milk, and he manages to get it back, and promptly sticks on a label which he has conveniently handy; are you aware that this is done?—I think you will find that when the new Act came into force on the 1st of January there was a pretty large stock—there naturally must be—in the retail grocer's hands, of labels that bear the word "separated." It was impossible for us to recall all the milk all over the country. We started ourselves about the beginning of October with labels, but there was some milk anterior to that date in the shops with the word "separated" on, that is, instead of "machine-skimmed," "condensed separated milk." According to the new Act it was illegal to sell this as milk, the word "separated" being no longer recognised. We issued very largely to all our wholesale and retail customers a small label with the words "machine-skimmed" on, which they should have affixed, and in the majority of cases did affix as soon as they had it. If you had looked at those labels you would find that they were all marked "separated."

10393. The point was that in the month of April samples of these products were obtained, although you, of course, had notification of what was going to happen—the Act was passed last August, you know?—Quite so.

10394. And it only came into force on the 1st of January?—Yes.

10395. And yet nine months or so after that we find from your showing that you do not appear to have overtaken your stock?—That is quite possible. We cannot be responsible for the stock in the wholesale grocers' hands. We do not deal with every small grocer in the kingdom. Our efforts are always to deal with the wholesale people. Some of them may buy once in three months and some buy oftener; in the country districts particularly it may be three months by the time it has got filtered down to the small shops, sometimes going through two or three or four hands. Then the milk may be held for some time. We had a very large firm in Nottingham who had some of our milk sixteen years in stock. We cannot be made responsible for what retailers do. We labelled our milk two months before the Act came into force, and I suppose we rendered ourselves liable under the Act for that, but we labelled our milk then "machine-skimmed," and we ran that risk. We can do no further. All these small tickets were issued to the grocers wherever they were asked for. We supplied about a million or a million and a-half of them; some of them went on other people's milk as well, I daresay.

10396. Has your milk been the subject of any judicial proceedings?—I daresay it has a good many times.

10397. Since the new Act came into force?—Not that I know of; I have not had anything of that sort brought to my notice.

10398. There was a case decided the other day under the terms of the new Act for a breach of the regulations as to labelling?—Is it Buckmaster's case? I saw a case reported in the papers of a grocer in the Westminster district or in St. George's Hanover Square and the label was surcharged with a stamp, but I am not aware what milk that was.

10399. You are not aware that it was your milk?—It may have been; we certainly had some labels so surcharged in the latter part of last year, but he has not given us any notice that it was our milk, and, as he has not done so, I conclude it was not.

10400. The particular brand that was sold in the way I have indicated, and which the label was afterwards put on, was surcharged in that way?—I think you would find that that label was probably supplied some time last year. We have things like that now, I know.

10401. Have you any suggestions to offer to this Committee, in view of the fact that they may have to draw up regulations, not so much with regard to machine-skimmed milk—for I suppose that will have to take care of itself—as with regard to the limits for determining when a presumption shall be raised as to the character of whole milk?—I do not see that very much can be done with machine-skimmed milk. You cannot fix a maximum standard of fat, and, of course, it will be supplied as skimmed as possible. As to full cream milk the question is exceedingly difficult. From our point of view, as I say, we find there are differences in the quality of milk—very great differences—at different times of the year, and any standard that would be fixed would have, I think, to be either pretty elastic or else would be a mere working standard.

10402. Do you supply any milk to the Government?—Yes.

10403. Do you supply under a contract as to what the amount of fat should be?—There is no contract that I know of.

10404. Are you aware that milk is supplied for the public service under a specification as to the amount of fat which it shall contain?—I have never seen in the contracts that we have received from the Admiralty or the War Office any specification as to the quantity of fat that shall be contained.

10405. You do not know that that is the custom of the War Office or of the Admiralty?—I have never seen any figures stated. We have always supplied the milk as full cream milk, supplying the milk as we received it from the farmers without abstracting any cream whatever; but I have never seen in the War Office contracts any standard fixed.

10406. Do you supply milk to the India Office?—No.

10407. Have you been invited to tender?—No; I do not think we have ever applied.

10408. Therefore you have no knowledge that the India Office, at all events, makes stipulations as to the amount of butter fat?—I do not know that we have ever applied to the India Office. The War Office and the Admiralty are the only two we have supplied, and I was not aware in fact that the India Office bought any milk.

10409. Do you think that a limit of 10 per cent. of butter fat is an absurdly high limit to demand?—We should certainly be unable to reach it, so much depends on the degree of condensation. It is impossible to fix a limit like that and say it must have 10 per cent. of butter fat, because in doing so you are fixing the limit of condensation. It would be possible theoretically to condense a milk and bring it down to 1·5, or 1·4, or 1·75, and then if you condense it six times you would have 10 per cent. of fat in your condensed milk, and yet that milk would have been tampered with; whereas another sample less condensed, though much larger in butter fat, might not come up to the sample. A sample that contains 4 per cent. which is condensed only twice might not come up to the standard.

10410. You have told the Committee that, speaking generally, you condense your milk four times?—To about one-fourth, but you see a very small difference may bring you down two or three decimal points lower. (*See foot-note* to Q. 10296.)

10411. What you now say is, that, assuming you still conform to the average amount of condensation that you prescribe, you cannot reach the limit of 10 per cent. of butter fat?—No, we could not, because you see if we had a 3 per cent. standard we should not come up to it.

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10412. Then I suppose you would be rather surprised to hear that a number of brands are sold to the Government for the public service in which the degree of condensation is never more than three times, and usually only $2\frac{3}{4}$ times, or some such number, and of which the amount of butter fat is more than 10 per cent.?—I should not be surprised, because the bulk of the full cream condensed milk is not of Dutch manufacture; it is either Swiss, or Norwegian, or English. They are practically two entirely different trades; if you take the machine-skimmed trades or the full cream trades, you will find they are conducted by different firms.

10413. I am only talking about your full cream. I am not concerning myself with your skimmed milk. You tell the Committee deliberately that with a condensation of one to four you cannot reach with your whole milk a standard of 10 per cent. of fat?—No. Supposing we had a minimum of 3 per cent. we could only come up to 9; and we cannot always get that minimum; for about four or five months of the year we fall below 3 per cent. on our butter fat in our fresh milk.

10414. In spite of the milks which do reach this limit of 10 per cent. of butter fat, and easily do so, and where, as I have said, the degree of condensation is never more than 3, and is usually between $2\frac{1}{2}$ and $2\frac{3}{4}$ times, the initial amount of fat in that milk from which this product has been condensed being not greater or not sensibly greater than what Dutch milk on the average contains?—I do not know which milks you are referring to; it is rather difficult for me to answer.

10415. As a large importer of Dutch milk, you deliberately tell the Committee that you cannot, in the case of whole milks, obtain with such a degree of condensation as you make, a limit of 10 per cent. of butter fat?—What I want to insist on is that it is impossible to guarantee the degree of condensation, and that any analysis that is based primarily on a fixed degree of condensation—thus fixing an arbitrary degree of condensation for milk—is impossible.

10416. I suppose the purchaser does not care one bit about the degree of condensation?—Excuse me, he does very much.

10417. Pardon me, what he wishes to get is a certain proportion of butter fat and solids not fat in what you sell him?—No.

10418. If you start with an initially rich milk it is a matter of no concern to him whether you condense it $2\frac{1}{2}$, $3\frac{1}{2}$, or as you say 4 times. If you start with an initially poor milk of course he requires you to condense it a little more. If you start with an initially rich milk, on the other hand, he does not demand such a high degree of condensation. He does not fix the degree of condensation—he is not concerned with that; what he is concerned with is the resultant product?—If you will excuse me, you are entirely wrong on that point. My experience is that the public goes entirely by the appearance of the milk when it is condensed. The public does not care a snap of the fingers how much you have condensed, whether it is machine-skimmed, or partly skimmed, or full cream or not—what the purchaser wants is a condensed milk which with a certain addition of water gives an appearance of ——

10419. Rich milk?—Yes. He does not mind how much you condense it—he does not know and he does not care a farthing. He would not mind if you put starch in or anything else so long as he can get a milk which has the appearance and consistency of rich milk.

10420. The public taste is, to some extent, vitiated, if I may say so, by the circumstance that they get products—you will excuse my saying so—of a character such as you send over to us containing 35 per cent. and upwards of sugar and with an appearance of richness and consistency in the product which, of course, they are not able to judge of; you give, if I may be allowed to say so, a fictitious appearance of richness by the addition of such a large proportion of sugar?—I do not know that it is that. If you do not put enough sugar in your milk will not keep, or else it thickens too rapidly, and gets very rapidly so thick as to be unsaleable.

10421. But there are large amounts of milk now sold, both whole milk and machine-skimmed milk, to which it is not necessary to add any sugar at all?—Are you sure there is machine-skimmed milk sold without sugar?

10422. I will not say there are large numbers, but there are brands, even now, of machine-skimmed milks which do not require the addition of sugar?—Of course you may have knowledge that I have not, but I may say that I have never yet met with a brand of machine-skimmed unsweetened milk; as a matter of fact, in this country the sale for unsweetened milk is extremely small. All that I know sold in this country as unsweetened milk is full milk. I have never heard that anyone had any demand for machine-skimmed unsweetened milk.

10423. I am speaking from what I know as regards the point of machine-skimmed milk; what *a priori* necessity is there to add sugar to machine-skimmed milk for the purposes of preservation?—Because the public ask for it.

10424. For the purpose of preservation there is no necessity, is there?—No.

10425. There is no more necessity to add sugar, there is, in fact, less necessity to add sugar, to machine-skimmed milk, for the purpose of preservation, than there is in the case of whole milk?—It would be quite possible, I suppose, to manufacture machine-skimmed unsweetened milk.

10426. Readily possible, even more so than in the case of whole milk?—Well, I do not know.

10427. Yet there are large quantities of whole milk sent to this country which do not contain sugar at all?—Excuse me, but you will find they are nearly all re-exported. They come into this country for re-export. Excuse me, but I think I know a little more about the actual sales of brands in the country than you do. We ourselves are making an unsweetened full cream milk, and we cannot get the English public to buy it. People will not have unsweetened condensed milk; they want a sweet article.

10428. (*Chairman.*) My experience on board ship is entirely contrary to yours?—On board ship that is so.

10429. Englishmen and Englishwomen on board ship always ask for unsweetened condensed milk?—You are quite right. Practically the bulk of the supply of unsweetened milk is for ships' stores and for export.

10430. That is to meet a popular taste?—No, it is not a popular taste in England.

10431. The great majority of English people sitting round the breakfast-table on board ship I have always noticed will not have the sweetened condensed milk—that has been my experience?—That has been my experience likewise when I have been travelling abroad on the large liners. We deal with a pretty big quantity of condensed milk, and our experience is that we cannot get the public in England—and our public is the lower-class public, not the higher-class public—to take unsweetened condensed milk. In countries where the condensed milk has been introduced more recently—in Rhodesia, for instance, where condensed milk was introduced after the rinderpest—it is the unsweetened milk that has gone ahead and which sells very much more than the sweetened milk; because there the public have had practically both kinds of milk, the sweetened and the unsweetened, offered to them at the same time, and they have, as I should do myself, naturally taken to the unsweetened first. But in this country, where the public taste has been educated to sweet milk, we cannot get them to take unsweetened milk. We should very much prefer to make unsweetened milk, because the customs duties on sugar in Holland are very heavy—about 100 per cent. That causes a very heavy outlay in capital. We have to pay a duty on the sugar coming into the country, and we only get it back on exportation. Sometimes we have to carry stocks for three or four or five months, which means that there will be a sum lying idle of from £20,000 to £30,000. We should be only too glad to do without that, but we cannot. We have to supply what is asked for. We tried to educate the public to that, but we find we cannot do it.

10432. (*Professor Thorpe.*) I know Holland and the circumstances of Holland. I not unfrequently go there, and I have many friends there, and I speak from personal knowledge. No doubt you are right as to the incidence of the heavy tax on sugar. I was about to take you on that point, because I suppose it is the balance of advantages or disadvantages to you as to whether you sell a relatively highly-taxed article or not. You say that if you could induce the public to take the thing without the sugar you personally would prefer to do it?—Yes.

10433. Have you tried actually to educate our people to take it?—Yes. We offer the milk, and we list it, but we cannot get them to take it.

10434. I spend as much time as I can on board ship—I certainly spend the greater part of some months of every year on my yacht, and I am from time to time dependent upon condensed milk—I do not take it unless I must, but now and again I am obliged to; certainly all my crew

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live on condensed milk, and they, as well as I, live on unsweetened condensed milk, which we find we can readily obtain in any port we go to?—Of course, because you go to yacht stores, but I would like you to come with me once round any of the shops in London in the poor districts. Our trade, as I tell you, is not a high-class trade, it is a poor trade. See how many shops you can get unsweetened milk in. You will not get it, I suppose, in one out of thirty in those districts. Ask them for it; they will not tell you it is not supplied, but they will tell you that people do not ask for it. I should like you to try that, because I think it would change your views on the subject. I fully agree that yachts and ships and export people use it. We make it ourselves for that purpose.

10435. You will not change my views at all, but I confess I have considerable sympathy with the movement which has been initiated largely by the Medical Officers of Health in this country protesting against the widespread diffusion amongst the poor people of an article which, as far as its solid content goes, approaches to two-thirds of its weight of sugar, which has to be so largely diluted with water before anything can be done with it in the way of feeding an infant, and which practically is almost a starvation diet to a child?—But I do not think much of it is used for the feeding of infants.

10436. We have had evidence on that point as to its widespread use. Naturally those people do not differentiate between one milk and another; they get that which is cheapest?—That is not our experience. We made some enquiries amongst the people in these poor districts, and the general result has been that the grocer tells us that if a woman comes in and wants milk for her child she buys the best class; she generally goes in for the most advertised brand, but when she wants it for use at home, in tea, coffee, porridge, puddings, etc., she has the very cheapest she can get. That has been our experience.

10437. What can a poor woman do when she is face to face with this label: "The Mother Brand," which reads so seductively, and when she gets it in all good faith she dilutes it to make it workable, and, apparently, if I am to trust to the analysis which has been given, she may start with a product which when it is diluted, instead of feeding her child with a milk which should contain 3 or even less per cent. of fat, practically feeds it with, at the most, one per cent.?—I do not think so. I think you will find it works out to 2·5 or 2·6.

10438. You tell us you have improved the quality of your "Mother Brand," but, at all events up to quite recently, she has been feeding her child——?—No, I do not think we have improved the quality; it is, to the best of my belief, made as it was twenty years ago; it has been made the same ever since.

10439. Why do we have such great discrepancies in the results of analyses as that between 5·6 and 7·85?—It is very difficult to say. I do not know that the analysis is absolutely correct.

10440. Of course, that is begging the question?—If that particular sample had been analysed by somebody else and checked it would have been very different. It has often been found that the analysis of condensed milk has not been correct.

10441. It was analysed by an analyst of repute, a gentleman who appeared before us by invitation on account of his public character?—It is possible it may be correct.

10442. He in his evidence drew our attention to the character of a large quantity of the milk which was being supplied as food for children?—Do you think an analyst knows exactly what is supplied to children, and what is not, in the shops of these poor classes? It is not his object to find out how much of it is used for the feeding of a child and how much for general household purposes. Do you know what that particular brand of milk was introduced for? For the miners in the colliery districts of Durham and Northumberland; they wanted a milk that they could take with them into the pits, a small tin, when they went down.

10443. The "Mother Brand" is specially for infants and children?—That was simply copied from the large label. We brought out a small tin that could be had cheap, because the full-sized tin of the "Mother Brand" (this is only half a tin) was too much for them to take down at one time. That is how we came to introduce the very small tin. It was not at all for infants; it was simply for miners' use. Of course, we cannot go and tell one man: You must sell this to a miner, and you must not sell it for a child. That is the purpose for which it was introduced, and the label is merely a copy of the larger label.

10444. You see, on every tin which you sell you pointedly draw attention to the fact that you do not recommend certain brands for the food of children, but you specially recommend them to buy the "Mother Brand" in almost every label you issue?—Of course we do; we recommend them to use full cream milk. I think in that you fully agree with us.

10445. This is the best article of the kind you produce?—That brand of milk is our full cream milk. If you took a sample at another time of the year—say, in October or November—you would probably find a very different analysis to what you do of the milk that may be condensed in the spring.

10446. I come back again to my question, which is, after all, the matter which is germane to this inquiry, and what we want to get at? In view of this condition of things what is this Committee to do in order to determine what limits shall raise a presumption that the thing is not what it ought to be?—You ought to take what the thing is. The trade has been built up, and the trade likes the machine skimmed milk as it is.

10447. I put aside machine-skimmed milk for the moment?—You are considering that machine-skimmed milk is all right as it is, and you are considering full cream milk?

10448. We have already stated that, provided you label adequately and in the spirit of the Act—that the notification should be in large and legible characters—we have nothing to do as a Committee with machine-skimmed milk; but now we are dealing with the question of so-called whole milk condensed; what are the limits which shall raise a presumption that that is not what it ought to be?—I can go no further than what I have put before you as to what we have from actual result found to be the limits of full cream in the milk as received from our farmers. That ought to be taken as the basis I think. It is very difficult if you have different countries producing different qualities of milk, because the milk coming from one country may be perfectly genuine and yet may not be as rich as that coming from another; and the time of year makes a difference too.

10449. I have attempted to show you that that kind of disparity, even if it exists to some slight extent, is not sufficient to account for these wide discrepancies which we found in the nature of this article; if you take milk and assume it has not been mixed with skimmed milk, and assume it is condensed to the proper amount, there is not that wide variation between the character of one milk and another?—It is all the question of condensation that you are turning on now—condensation to a proper amount.

10450. I suppose you will admit that if you sold whole milk in a tin as condensed milk, the customer would be prejudiced?—Exactly.

10451. The point, then, is where you are going to draw the line?—I say you can safely leave that to the public; they will invariably refuse anything that is too thin; we know it will be refused by the public and likewise any milk that is too thick—over condensed or under condensed, or which has got thick, either through age or otherwise.

10452. In the presence of something like forty per cent., as it may be of cane sugar, how are the public to protect themselves?—Is there any fraud in putting forty per cent. of cane sugar in?

10453. If the indirect effect of that is to cover up the nakedness of the milk, I should think there is?—The milk is sold as machine skimmed milk.

10454. We are talking of whole milk at present?—Then I do not think you put forty per cent. of sugar in whole milk.

10455. It occasionally happens; however, I will take you on the results of your "Mother Brand" again; there is 36·92 of sugar in that?—It is about forty. Have you analysed other milks?

10456. I have analysed many milks?—Do you find they come very much different to that in the percentage of cane sugar?

10457. I am not under interrogation myself?—There may be a difference, but I do not think there is very much. I think you are going on the basis that manufacturers are trying to cheat the public, and I do not think that is the

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case. The public looks after itself very sharply in those matters. It is a question of supply and demand, and the public are educated by certain well known brands. They know very well when they want a full cream milk, and if they do not get something that is very much like it they pretty soon tell us. I frankly admit that the Dutch milk does not come fully up to Nestlé's milk. I think Nestlé's milk a better quality of milk, and the public find it so. Although we offer this at a good deal cheaper than Nestlé's, they very often buy Nestlé's instead. You must not think we are getting the same price for an inferior article; we are not.

10458. No, but on the general question of the public protecting themselves. Of course, the *raison d'être* of this Committee is that the public, apparently, is unable to protect itself?—You must not take condensed milk and ordinary milk as absolutely on the same basis. Ordinary milk is not a proprietary article, and anybody can go and sell it. The ordinary purchaser cannot distinguish the milk from one cow and another cow. They cannot tell whether it is milk given in the spring of the year or not. They cannot tell you any more than that condensed milk is a different thing which ought to come to a certain consistency and appearance to be palatable, or to be accepted by the public. They very largely go by the label. Condensed milk is a proprietary article, and unless that proprietary article is kept up always to the same standard of quality, the sale will fall off very rapidly. It is to the interests of the manufacturer to keep to his standard of quality, and his standard of quality must be as high as possible, because competition tends to keep it so.

10459. On your own showing, the best article you sell, your "Mother Brand," is of an exceedingly variable quality, and you say that that is inevitable?—The variation in the butter fat is inevitable.

10460. How does the public, therefore, determine it; do they at times reject your "Mother Brand"?—We certainly have sometimes milk sent back because a man may find it too thin. I may have milk sent back because it is too thick. Every milk manufacturer has the same difficulties to contend with.

10461. I again press you; you have no practical suggestions to offer to us to guide us in the definition of the limits which shall raise the presumption that the article is not as it should be?—I do not see how you can determine any standard. If you fix it that the condensed milk must contain so much per cent. of fat; if you for the purposes of the Customs analysis, determine that there should be a certain percentage of fat to the solids not fat, then it seems to me you are getting on a much sounder basis, because the proportion of fat to solids not fat cannot be tampered with—or not easily.

10462. Do you mean the ratio of milk solids not fat to the fat solids?—Yes.

10463. We can easily determine the ratio of the milk solids not fat to the fats; do you think that affords a basis for defining the limits?—So far as I can judge, I think that is the only basis that can be taken.

10464. Assuming that those two factors are to be taken into consideration in defining the quality, how would you express the definition of the limits?—I do not know that it is my duty to lay down any law on the point. I have simply come prepared with figures showing what we find them to be. Taking the ratio of nine to 25·5 for the purpose of the argument, in five cases we come over that ratio, and in seven we come under.

10465. What are your data?—If for the purposes of argument we may take the ratio of butter fat to the solids not fat in normal milk to be as nine to 25·5. We should find this ratio in our milk was steady during seven months of the year, and was not reached during the other five months. Taking 25·5 as a fixed quantity, we find that the ratios would be in January 9·93, February 9·50, March 9·41, April 8·93, May 8·76,, June 8·62, July 8·98, August 8·93, September 9·51, October 9·71, November 10·53, and December 9·90. I have shown these variations in a second diagram—(*producing same*)—this being from milk taken in 1899. This diagram will show the variations of fat in the whole of the South Holland milk of 3·15—the same corresponding months.

10466. It is based, apparently, upon a mean average of fat in the whole of the South Holland milk of 3.15—that is your datum line as regards fat, is it not?—That shows the mean average for the whole year.

10467. The mean average of your fat in South Holland milk over the whole of the months of the year 1899 may be taken at 3·15?—Yes.

10468. And your solids not fat were 8·55?—Yes. Those are the mean averages for the whole year.

10469. The fluctuations in the solids not fat ranged from 8·47 to as high as 8·63?—I think that would probably be about right. I have not got the figures down here.

10470. As regards the milk solids not fat, there is not a very large variation?—No.

10471. The great variation is, as you say, in the amount of butter fat?—In the fat itself.

10472. Those variations in the amount of butter fat, of course, correspond, roughly speaking, with the variations you have already dealt with on your first diagram?—Yes.

10473. Therefore, we should be doing you no substantial injustice—we certainly were doing you no injustice whatever—when we took our limit of three per cent. of fat?—I make out that during seven months of the year the ratio nine to 25·5 would be a perfectly fair one.

10474. Would you permit me to draw another datum line through this second diagram of yours as, perhaps, a graphic representation brings things out more clearly?—Yes.

10475. This line that I have drawn, as a matter of fact, shows that you would be under three per cent. only during three months?—Yes, but if you take it on a ratio of the solids not fat, it comes to five months.

10476. I put it to you; are you being unjustly dealt with if we, in England, assume, as the basis of the initial fat value of your milk, three per cent.?—We might be.

10477. In what number of cases?—During three months of the year we might be; and if we take the ratio of solids not fat it works out to five months during the year.

10478. I venture to say that in that limited period, giving you the whole portion of the three months of the year, there is no hardship on you in asking you to condense a little more?—But the condensing would have nothing to do with that.

10479. Yes, it would raise the relative amount of fat?—If we condensed any more our milk would not be saleable.

10480. Surely the degree of condensation required to bring that up to three, or very near to three, is negligable?—It is not; I wish you could realise what it means to condense a point more or less.

10481. Anyhow, this is perfectly clear, that assuming we do touch you by a three per cent. limit, that, during the greater portion of the year, certainly nine months of the year, you can take off with impunity a very large proportion of the cream?—We might, but we should not do so.

10482. In other words, you would mix that with a relatively large quantity of separated milk?—Of course, it might be done. I do not say we should do it in any case.

10483. Still, with the curve before you, and these facts you have told us of, you are not yet in a position to say whether we should hit you hard if we asked for at least 10 per cent. of butter fat in condensed milk?—No, because I do not think you are acting fairly in fixing the standard to which the milk should be condensed.

10484. On your own showing, you told us you condensed on the whole about one-fourth?—I said we do not guarantee that; it is that, roughly speaking. I think the way in which it is fair to take it is that if you want to see if the milk is full cream or not you ought to take it on the proportion of solids not fat, of course, taking into account the amount of condensation.

10485. Will you hand in these diagrams?—Certainly, with pleasure.

10486. If I draw the line of 8·50?—That will not show the exact ratio.

10487. No, but it will show his Lordship how often you are likely to come below 8·50?—That does not show the ratio between the two.

10488. No, but we can get that out?—I have worked that out, too. They come five months below the ratio and seven months above on those particular figures.

10489. If you would kindly put in those diagrams they speak very eloquently for themselves?—That is exactly why I drew them out.

10490. (*Major Craigie.*) They are very useful?—I have taken a good deal of trouble to get those out from a large number of analyses. I did not think you were going to take the figure of condensation, or I might have brought a great many more papers. I have a few here

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showing the actual results and to what extent we condense the milk. If you care to look at these, very well; but these are matters of trade secrets, and I should not care to have them published.

10491. (*Dr. Voelcker.*) What proportion of the manufacturing goes on in the three months when you anticipate any difficulty? Would those be heavy manufacturing months or not?—They are rather heavy manufacturing months, inasmuch as they are the months in which we get the largest supply. We get the largest quantity during the months when the quality is poorest.

10492. You have not stated to us what are the limits which you take in purchasing milk from the farmers?—No; those limits, as I said, are fixed according to circumstances. If in a certain district in a certain month 3·32 was the fat in the average milk supplied by the farmers there we should consider that a sample of 2·50 was evidently wrong. If, again, we took in July, say, a sample of 2·20, when the average was 3·1, we should think that would be evidently wrong.

10493. You fix your standard according to the quality of the milk the people are sending in at the time?—According to the average quality of the milk the people are sending in each month, as we consider that is the fairest plan. We had a month some time ago when it went up to 3·88. We should take a sample of 3·01 at that time as distinctly wrong.

10494. What guarantee have you that it has not worked down to that, although you do not announce it? How can you guarantee that what is supplied to you is not really lower than the produce by the cows?—We cannot guarantee it, except that we think it is exceedingly unlikely that all the farmers would combine to skim their milk all at once, knowing, as they do, the risk they run of being penalised.

10495. (*Mr. Barham.*) Professor Thorpe has not put it to you, but supposing we fixed a minimum for fat in milk, either a minimum for condensed milk as we find it, or a standard to which the milk could be watered down in order to bring it to the consistency of ordinary milk, would you have any difficulty in adding a sufficiency of cream to it to bring it to that standard?—Supposing you fix a standard of, we will say, 3 per cent.—that pure whole milk must contain that amount—should we have any difficulty in the months when our normal standard is 2·70 or 2·80 in adding 0·2 of cream to the milk? That could be done; but I am not prepared to say now what the extra cost would be, and how far we should be able to bear it as compared with our selling price. It would evidently mean an enhanced selling price for us if we had during certain months of the year to add cream, and, of course, then we should get the solids not fat not in their normal proportions.

10496. (*Professor Thorpe.*) Assuming these low months you can get the same thing by separating a portion of the fore milk of the cow?—Yes, but we can make no difference between the different milks of the cow. We receive the milks from the farmers, the whole thing together.

10497. Anyhow, it could be met?—It would have to be at an increased expense in any case.

10498. (*Mr. Barham.*) Drawing a line on your first diagram, which I have taken the liberty of drawing, I notice that in 1896 that for seven months of the year you had milk supplied to your factory below 3 per cent.?—Yes.

10499. (*Chairman.*) That does not correspond with the other diagram. I cannot understand that?—If you will look you will see that the one diagram deals with maxima and minima and the other with averages. There is, of course, a difference between the two.

10500. (*Mr. Barham.*) In 1897 for nine months, and in 1898 for nine months, and in 1899 for seven months the milk was below 3 per cent.?—Yes.

10501. You say your milk is the produce of Dutch cows—it must be so?—Yes.

10502. Are they of one breed? Are they what is known in this country as Hollanders, or Frieslanders, as I think they are known in Holland?—I do not know what they are known as here.

10503. There is more than one breed, although one breed is general?—It is the ordinary black and white cow.

10504. (*Dr. Voelcker.*) The East Frieslander?—They would not be East Frieslanders.

10505. (*Mr. Barham.*) There are two different breeds, but one breed is very general. Are these cows that produce this milk ill-fed, badly fed, or improperly fed, as far as you know?—Not as far as I know; but you know that Dutch cows are left out in the fields very long, and there is always a quantity of water in them, naturally, the land all being low-lying land, so that the cows are drinking practically the whole of the day.

10506. When we are surrounded with water we do not drink a larger quantity than at other times?—That, I am told, is the case.

10507. The produce of the land is very fertile?—Yes.

10508. And the grasses and clovers grown in Holland are exceedingly good?—Very good at times.

10509. You especially exclude by your arrangements with the farmers the use of brewers' or distillers' grains?—Yes.

10510. So far as you know and can arrange this milk is the natural produce of the cow fed on the natural food of the country?—Exactly.

10511. (*Chairman.*) How do they feed the cows in Holland? Do they tether them?—No, not in the field; they just wander about as they like.

10512. Have you ever made any effort to improve the quality of the milk sent to you?—If a milk is distinctly poor we discontinue to deal with the farmer. We warn him first that we shall have to discontinue it, and we do discontinue it in the end if it does not improve. We endeavour to get only the highest class of farmer with us.

10513. It appears from what we have been told by Professor Thorpe of the returns of Dutch milk from officials in Holland, that the general average of the milk in Holland is considerably higher than is apparently got in your factories?—I am very surprised at that. I should like to see it confirmed.

10514. Is it not possible to put pressure on those who supply your factories to improve the quality of their milk, or do you say they have reached the high-water mark of feeding and possible improvement?—I do not think we can put much more pressure on than we do. It is to our interest to get milk as rich as possible for our butter. We are anxious to make as much butter as we can out of the milk.

10515. In reference to these analyses that you have given to us, taken by your own analyst, do you know what process they were taken by?—The Soxhlet.

10516. Is that a centrifugal process?—Yes, it is Dr. Gerber's machine and Soxhlet's. That is the machine I have used myself many a time.

10517. Is that considered as satisfactory as other processes we have heard mentioned?—I think so; we find it very rapid. Of course we have a lot of these things to deal with, and we want to get them done as quickly as possible. I think it has been, generally speaking, a very satisfactory one.

10518. (*Dr. Voelcker.*) I think there is some mistake about its being the Soxhlet?—It is Dr. Gerber's machine.

10519. (*Professor Thorpe.*) The Soxhlet process is not a centrifugal process?—I believe the Soxhlet process is the process we use for special purposes, and Dr. Gerber's centrifugal process we use for the rapid taking of the fat.

10520. (*Chairman.*) Do you get a drawback on the sugar in your milks when you export them?—Yes.

10521. You are not prepared to suggest to us any particular standard, I understand; you give us your figures, and leave us to draw our own conclusions?—Yes, I am afraid I can do no more.

10522. (*Professor Thorpe.*) It is very important to know that you get a drawback; the actual value therefore of the sugar is not, as you perhaps unwittingly led us to believe, so very important, when you get such a very large proportion of what you paid for it back in the drawback?—Excuse me, I thought I made it clear at the time that it necessitated a heavy outlay of capital. We shall get a drawback, but only after the milk is exported from the country. It is necessary to keep large stocks at certain times of the year when the supply in Holland of fresh milk is great and the demand for condensed milk in England is small. We have to keep large stocks then at our factories. The capital invested in the sugar is therefore lying idle at this time, and as I said, this capital means very large sums.

10523. What is the ratio of the duty on the sugar to its actual price?—As a matter of fact it just about doubles it.

10524. (*Chairman.*) 100 per cent., you would say?—Just about 100 per cent., practically speaking.

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10525. (*Professor Thorpe.*) You get half the value back again?—Yes. All the time it is in Holland in stock for several months, we have had to pay the duty on it, and we do not get it back until the milk is actually re-exported to England. So we have to invest capital in the duty on sugar, and, of course, where we have large quantities of milk with a large proportion of sugar in it it means a big sum.

10526. (*Dr. Voelcker.*) Do you, as a manufacturer, see any objection to limiting the amount of sugar that is allowed to be used in the case of sweetened condensed milk?—It would all depend on what limits were fixed; if they were made very elastic, I do not suppose there would be any very serious objection.

10527. What limit would you not object to see?—If the limits were fixed between 30 and 55 I suppose we should not particularly object, but it is a matter so very delicate that I do not think even a Board of Manufacturers assembled themselves would care to decide off hand how much sugar ought to be put into milk and how much ought not to be. It varies according to the quality of the milk, and according to what destination the milk is for.

10528. What is the delicacy when it is not absolutely necessary?—Because if you put some in you have to put just the proper quantity for the particular market, otherwise you get your sugar separating and crystallizing.

10529. That tendency would be greater, the greater the amount of sugar you add, would it not?—Yes, it would depend on the amount of condensation, too.

10530. What would be the limit that you would be prepared to accept, supposing it was stated that you must not have more than a certain amount?—It would be rather difficult to say. I do not know of any cases in which it has gone up to 55, but it might have to be done.

10531. If it was desirable in the interests of the public that they should have milk and not sugar, what would be the smallest quantity you would be willing to put in?—If you are going to make unsweetened milk, it need not contain any sugar at all. But you cannot do that at present in the public interest. If you want to do your business properly you have got to put the amount of sugar in it that the public demands.

10532. Do you, as the manufacturer, put the sugar in because the public like it, or because it is necessary for your particular manufacture?—Because the public like it. We would rather put no sugar at all, but you must not have half measures—you must either put in the proper quantity of sugar, or none at all.

10533. The amount of sugar in your different brands is very variable?—Not enormously so.

10534. Are we to conclude that you put in these varying amounts of sugar in these particular brands because the public likes that particular amount of sugar put in, or would those brands be materially altered in the appreciation of the public if you appreciably altered the quantity of sugar?—I think so. You must remember that these figures have been obtained as the result of many years of practical experience as to which was actually the best quantity of sugar to put in to get a proper palatable article in every way.

10535. Poor people are the ones who buy your condensed milk mostly?—Chiefly.

10536. Do you think that the reason they take this poorer quality in fat and the sweetened milk is because the sugar gives a sweet taste to it, and they like it because of its taste?—Certainly, you must remember that it is sold considerably cheaper than the full-cream milk, and then the public, many of them, like it because it has got both the sugar and the condensed milk in, and when they take their cup of tea or cocoa or porridge, or put it on the bread and butter for the children to eat, it has a nice sweet palatable taste.

10537. Poor people buy this milk for their children?—We do not believe they do; the result of our enquiries is that they generally do not buy machine skimmed milk for their children.

10538. I am not speaking of machine skimmed milk?—Full cream milk is to a certain extent outside—not entirely, but very nearly outside—the scope of our experience. We only sell about 5 per cent. of our total quantity of milk as full cream, so that our trade is practically a machine skimmed milk trade.

10539. You do not think that your machine skimmed milk is used much by the poor people for nourishing infants?—I do not believe it is.

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10540. (*Professor Thorpe.*) You are a Fellow of the Institute of Chemistry, and a member of the Council of that body?—Yes.

10541. You are a superintending analyst of the Inland Revenue branch of the Government Laboratory, and you have been employed there for thirty-five years?—Yes, I have.

10542. You have been engaged on food analysis before the passing of the Food and Drugs Act of 1875, and you have since been largely employed in connection with analysis of samples of food and drugs referred to the Government Laboratory under the provisions of the twenty-second section of that Act?—Yes.

10543. You have taken part necessarily in the control analysis of food samples, especially those of milk and butter, with the view of determining the range of natural composition in samples of undoubted genuineness?—Yes.

10544. You have also taken a special interest in the applications of various accredited methods employed in the analysis of these commodities?—Yes.

10545. You appear here to give evidence by the invitation of this Committee?—Yes.

10546. Would you kindly state as briefly as possible how the Government Laboratory became connected with the working of the Food and Drugs Act?—The Government, or Somerset House Laboratory became connected with the operation of the Food and Drugs Act in 1875, when the Legislature gave effect to the recommendation of the Select Committee of the Food Adulteration Act of 1872. The Committee which reported in 1874, suggested that "when the analysis of the chemist of the local authority is challenged, the sample which is the matter of dispute shall be analysed at the Laboratory at Somerset House." In the following year—that is, 1875, as stated, the recommendation was embodied in the twenty-second section of the Food and Drugs Act of that time. Since that time the Government Laboratory was put into the crucible—in 1894, 1895 and 1896—before the Food Committee, and in their report, I find it written that no sufficient evidence has been laid before them to "warrant the belief that the important duties imposed upon the Government Laboratory by the Acts have been discharged otherwise than with efficiency and advantage to the public." That was after we had been twenty years in existence as a Court of reference.

10547. In consequence of this connection you have had to take steps to satisfy yourself as to the composition of genuine milk?—Yes. It became necessary to satisfy ourselves as to the composition of genuine milk, and the best method of analysis, with special reference to the accurate determination of the fat and the non-fatty portion of the milk. Authentic samples were obtained from different parts of the country, both from single cows and the mixed milk of dairies, the milkings being taken in the presence of a Chemical Officer of the Laboratory. The investigation was continued from 1875 to 1881, and after that for a few years to a less extent, but more fully again in 1891 and 1892.

10548. What you have now told us has reference to the analyses which were made as to the composition of milks at various intervals during that portion of the time?—Yes.

10549. In view of the working of the Act, in view of the fact that reference samples were coming to you, it was necessary to fix upon certain limits as to when a charge of dilution with water or abstraction of fat could be sustained?—Yes.

10550. Would you kindly explain to the Committee how you arrived at the particular limits?—The limits were 2·5 of fat, and 8·5 per cent. of non-fatty solids. The reason why those particular limits were adopted was first because a not inconsiderable number of the samples showed an amount of fat as low as, and even lower than, this limit, and, secondly, because it was thought desirable to have regard to the results yielded by single cows to a greater extent than is now deemed necessary.

10551. What do you mean exactly by that; why should you regard single cows in those days, and why do you now regard it as no longer necessary to deal to the same extent with the product from single cows?—I think the milk business has altered to a large extent. There are a greater number of cows in the dairies, and the manner in which milk is produced and sold is different now to what it was then.

10552. In 1891-2 you told us that a further inquiry was made into the Somerset House Laboratory?—Yes.

10553. And on the same lines as in 1875 and 1881?—Yes.

10554. What was that inquiry for?—To ascertain whether the normal character of the milk supply had been in any way modified by the operation of the Food and Drugs Act, and, as shown by the table, the proportion of cows yielding milk of so low a quality as in 1875 was found to be considerably reduced, very few cows indeed yielding an amount of fat so low as 2·5 per cent. The Parliamentary Inquiry of 1894 furnished additional evidence of the effect of the working of the Act in eliminating breeds of cows yielding milk containing a low percentage of fat. Accordingly, in 1894, the limit of fat was raised to 2·75 per cent., and five years afterwards it was further raised to 3·0 per cent. Our general policy, indeed, as regards limits, has been to follow closely on the heels of the enhanced quality of the supply resulting from the natural operation of the Act.

10555. Would you kindly take the Table referred to—Table 2, I think you call it—and briefly summarise what the analyses which were published in 1891 and 1892 gave?—273 single cows gave 12·89 of total solids, as an average made up of 8·90 for the non-fatty solids, and 3·99 for the fat. In the case of 55 dairies the total solids were 12·96, the fat being 4·0, and the non-fatty solids 8·96.

10556. For practical purposes I suppose we had better confine ourselves to the Table which shows the results of the analyses of the mixed milks of the fifty-five dairies. The result of the analyses of the 273 cows individually is mainly put together to show the influence of the breed, the period of lactation, the age of the cow, the character of the food, the amount of milk yield, and so on—all the conditions which we have learned to know affect the quality of the milk produced?—Yes.

10557. The Table which shows the analyses of the dairy or mixed milk, practically relates to the same milks which are contained in the Table relating to individual cows, does it not?—Yes. They are taken from the same dairies, and it is rather interesting to note the result of the aggregation of these single samples which were taken from the same dairy as the dairy sample, and, therefore, what might be given by small dairies of this number of cows, namely, four, five, or six; and the results in those cases are interesting, as bearing upon the question of the limit of fats and non-fats. I find that when you put these several single samples together the lowest in fat is 3·20, and the next 3·27. These are the only two low figures, whilst all the others are from 3·5 to 3·6 upwards; that is, from dairy samples, which include only four to six cows' milk in each mixture.

10558. In the first place I should like to bring out that the method of analysis of those mixed milks, as of the individual milks, is the same as that which would be adopted in the case of a reference sample—is it, or is it not?—It is exactly the same, that is to say, the principle of the analysis is the same; there would be a little additional precaution taken with regard to neutralising the acid, otherwise the method is exactly the same.

10559. Confining ourselves to the results of the analyses of dairy or mixed milk, those are in a measure summarised in the Table showing the range of quality of the 273 samples, and the 55 samples drawn up by Dr. Liversedge?—Yes.

10560. Would you kindly tell the Committee broadly what that Table teaches; I think perhaps we had better confine ourselves to the dairies?—In the case of the dairies, having reference to the fat, we have only 2 per cent. of those milks (and that represented only by one sample), where the fat is below 2·99. I would like to add here as explanatory of that low figure that when the four or five cows of that dairy are summed up and the average taken, the amount reaches 3·3, so that I cannot explain how this particular dairy sample was lower than the mixture of five of the cows from the same dairy.

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10561. (*Major Craigie.*) Were both samples taken from four or five cows?—No, it was a very much larger number in the case of the dairy sample, but the four or five cows are better than the mixed dairy sample. I am not quite sure whether there is not an explanation in this case which was given in another, namely, when the milk was passed through the refrigerator, it was found that the refrigerator leaked, and the product was much weaker than the average of the single cows. We have eliminated that case where the refrigerator leaked; but I am almost inclined to think that this exceptional case was one due to the leaking of the refrigerator, and was really not a true average of the dairy.

10562. You think that it is a case of probable error?—Yes.

10563. (*Chairman.*) Were those cows milked in the morning or in the evening?—Sometimes one, sometimes the other. In the case of the milks of the dairies, which give under 3·20 of fat, that is represented only by a single cow, which is equal to 2 per cent.; but when we come to between 3·20 and 3·50 we have 15 per cent. of the samples of that quality, and then 32 per cent. where it is under 5 per cent.; so that nearly the whole of the milks, you may say, if you eliminate those two single cows, would be from 3·20 to over 5 per cent.

10564. (*Professor Thorpe.*) Turning to solids not fat; what do the results indicate?—There are only 4 per cent. of the dairy samples under 8.5 per cent. of non-fats, 11 under 8·7, 38 under 9, and 45 under 9·5, two only being over 9·5.

10565. As the result, as you have told us, of this Table, and in consequence also of the evidence which was given before the Select Committee, the standard was raised first to 2·75, and eventually to 3 per cent.?—Yes.

10566. (*Chairman.*) In the earlier days the analysis of these samples was conducted under a different process, I believe?—No, it was under the same process.

10567. The whole way through?—All the way through—we have never altered what we have called the maceration process. There is no doubt that in later years refinements have entered into the analysis, which perhaps did not obtain at the very earliest period, and these more exact methods or application of methods apply to this later Table.

10568. (*Professor Thorpe.*) Would you kindly, very briefly, in order to bring out what you have to tell us respecting the methods used in the Government Laboratory, state the essential principles of the existing methods of milk analysis, the accredited methods, we may call them?—Yes. Would you allow me to indicate here what is of some interest perhaps in relation to this inquiry, namely, that when we adopted 2·75 as a standard or limit, it was not rigidly adhered to, because I recollect a case in which we found the fat was equal to 2·85, or something like that; but we went against the milk, and supported the analyst, because its non-fatty solids reached 9·5, and we knew therefore perfectly well that 2·85 of fat was not a normal relation to so high non-fats, and that we would have to decide the case on a much higher limit than the one which was in use at the time. The methods of analysis which are open to analysts, and which have been more or less in general favour, may be described under the following divisions:—1, dry extraction methods; 2, wet extraction methods; 3, centrifugal methods; 4, calculation method; 5, maceration methods. Of the first-named two methods may be referred to—the Wanklyn, and the paper coil process of Dr. Adams. The Wanklyn process is briefly one by which the fat is extracted from the dried residue from 5 to 10cc. of the milk, by three or more successive treatments with ether. The fat, after the evaporation of the ether, is weighed and deducted from the total solid obtained by drying 5cc. of milk over a water bath for three hours. The difference is reckoned as non-fatty solids. The coil method consists in the use of a coil of blotting-paper for absorbing a definitely weighed or measured quantity of milk, thereafter drying the coil and extracting the fat by ether in a Soxhlet apparatus. As in the Wanklyn method, the weight of fat obtained is deducted from the dry total solids in order

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to estimate the non-fatty solids. The only wet extraction process which appears to have met with anything like general approval is that of Werner-Schmidt. In this process 10cc. or a definite weight of milk is heated in a graduated 50cc. measure with an equal quantity of hydrochloric acid until the mixture turns brown. When cooled the fat is extracted by shaking up with 30cc. of ether, allowing to stand, and noting the volume of etherial solution which separates. The fat may be estimated either from an aliquot part of the ether solution or nearly the whole of it may be first removed, and then, by one or more small additions of ether, added to the original mixture without further shaking, the whole of the extracted fat may be recovered. The latter modification of the process is used in the Government Laboratory. The three methods which are most used, and come under the head of centrifugal, are the Babcock, Gerber, and Leffmann Beam. The process, with a few modifications only, is similar in each case. It mainly depends upon the solvent action of concentrated sulphuric acid upon the curd of the milk, which allows the fat to separate in a liquid condition. This part of the process is carried out in a specially constructed bottle, having a long narrow neck, which is carefully graduated to tenths of a per cent. of fat. After the addition of the acid, and while the mixture is still hot, the bottle is placed for two minutes in a centrifugal machine giving 400 to 500 revolutions per minute. The effect of the motion is to separate almost completely the fatty from the aqueous portion of the mixture, the former being found in the narrow neck of the bottle, which during revolution is nearest to the centre of the machine. The chief difference in the three modifications lies in the use of one cc. of amyl alcohol in the Gerber and 3cc. of a mixture of equal part of amyl alcohol, and hydrochloric acid in the Leffmann Beam process. The addition of sulphuric acid is common to all three methods. The calculation method requires the determination of the specific gravity and total solids to find the fat, or, *vice versa*, the specific gravity and fat to obtain the total solids. The third product, as the case may be, is calculated by means of an arithmetical formula based on the analysis of normal milk. A slide rule, called the "Milk Scale," has now been constructed on the basis of the milk formula referred to, and supplies a ready and convenient method of calculation.

10569. Those are, briefly stated, the essential principles of the methods which are commonly in use by analytical chemists, and are so-called accredited methods?—Yes.

10570. Would you please point out to the Committee what method is in general use in the Government laboratory, and why?—This process, which is described in my proof in some detail under the head of "The Analysis of Sour Milk,"—(*See Appendix* XXIX.)—has been followed in the Government Laboratory, with the exception of a few slight modifications in the analysis of both new and sour milk, since the passing of the Act of 1875. I have brought here the kind of capsule that is used for the purpose in these analyses, and I have brought in it the glass rod that is used in the maceration, and also some of the dried solids after the fat has been extracted, and which have been dried for a number of hours—perhaps from eight to ten—until a constant weight was obtained. This is the vessel used. In this case we have three of these capsules, one for the total solids and two for the duplicate experiments for ascertaining the non-fats and the fats. We take about 10 grammes of the milk, which we dry down or nearly dry down. If it has been brought to too great a degree of dryness we add a little alcohol for the purpose of bringing it into the state of what may be represented by very dry cheese—that is to say, a state in which you can rub it down. Afterwards you heat that for a little while until all the fat is in a liquid condition. We then pour on 20 c.c. dehydrated ether, and begin to macerate with the glass rod. Then we pour off the etherial solution, which contains in the first extraction something like 90 per cent. of the fat that was in the milk. That is poured through a filter which has been carefully tared in a glass bottle—a method which is well known to analysts. This treatment with ether is repeated from six to eight times, according to the fineness and the character of the residue which you find under your rod. At that period all the fat has been extracted. Occasionally we ascertain this by a further extraction with ether, if there is any doubt at all. After filtering into a clean vessel, and evaporating that, we can tell whether the last extraction has contained any fat. We then place the milk solids in a water oven, which is kept at a temperature of 212° F. for from six to eight hours, as it may require, weighing at intervals of two hours, until constancy is reached, which is represented by simply a loss of a milligramme in weight. We then judge the solids to be dry. That is one of our factors. Therefore, on deducting the weight of the platinum dish, we get the weight of the dry non-fatty solids, which, calculated on the quantity of the milk taken, gives the percentage. The same thing is done with your fat; the ether is allowed to evaporate and the fat residue carefully dried, two or three weights being taken, until you get constancy. We have then in these two fractions—in the fatty fraction nothing but fat and in the other the non-fats, also weighed directly. But we have got our third capsule, about which I have spoken. That must agree with the weight of the fat and the non-fat within a few hundredths of a per cent. We deem it to be a satisfactory analysis when the weight of the total solids, which represent the fat and the non-fat, agree with the duplicate experiment of the non-fats plus the corresponding fat which had been extracted from it. I might point out here that this is the only process—I think I can claim that for it—which extracts fat and nothing but fat. All other methods—the Gerber or even the blotting paper (the Adams' process)—are not altogether faultless; that is to say, there is something that comes out of the paper and out of the sulphuric acid products. You have decomposition in the case of the Gerber and the Babcock, and even in the case of the Werner-Schmidt, which is one of the best wet extraction methods, you get a quantity of foreign matter, which, however, does not interfere with the general result, because there is a give and take in the experiment, a small portion of the fat being kept back, being made up for by a small portion of the amyl alcohol or the decomposition products which accompany the process.

10571. It has been alleged by certain of the public analysts that this method gives a too high proportion of non-fatty solids in the milk—either, as alleged by one set of analysts, fat is actually left in the residue you call non-fatty solids, or a certain quantity of moisture, as is alleged by another set of analysts, is retained by the milk sugar in the non-fatty solids. In the first place, I suppose both contentions cannot be right?—No, they cannot be very well.

10572. Is it your experience, or within your knowledge, that either contention is right?—No, it does not apply at all.

10573. Would you kindly explain to the Committee, because this is down in black and white, why neither of these contentions can be valid? First of all, take the contention that fat is left in—I have only to submit this residue as a physical criterion of the kind of non-fatty solids which are dealt with by the ether to appeal to anyone who understands anything about maceration with ether. With this fine state of division to which it is brought, it is impossible that the ether could have left any of the fat in.

10574. In any case, can you directly prove that no fat has been left in—that is what I should like to know. Is there any direct method of showing that?—The precaution, as I said, which we take, is that we ascertain by further extraction whether any fat can still be extracted.

10575. There is no *a priori* reason why, if there was fat there, it would not be extracted by the method?—Quite so. We have gone even further than that. We take those solids as they appear in the capsule, and convert them again into a fresh state of mixture by the addition of a little alcohol—that is, restore them to their original condition, and again begin with ether, just as if we were beginning *de novo*, with the result that we get no more fat out.

10576. Now, as to the objection which has been raised, and not supported by any evidence that we can find; but nevertheless, which has been raised, that the milk sugar retains a certain quantity of moisture which is not expelled at 212 degrees. How, from your knowledge, can that assertion be invalidated?—We have dealt with hydrated milk sugar; by subjecting that to the same amount of drying we can reduce the milk sugar to its anhydrous condition. The contention has been given up altogether that we leave any water at all in association with the milk sugar—that is, on the part of some of the most experienced analysts. They did hold that opinion at one time, but I have not heard that any analyst of repute raises that objection now.

10577. You will find when the evidence comes to be printed that certainly one analyst of repute did advance it as a probable reason why there might be a slight excess in the amount of non-fatty matter as determined by the process you have described, and that is the reason why I brought out from you the fact that in your opinion there is no ground for the statement ; in fact, there is direct analytical proof—I indicated to the Committee that I should bring this out—that no such contention is valid. Of course, in the Government Laboratory we have mainly to do in the case of reference samples with sour milks ?—Yes.

10578. Would you kindly explain to the Committee what modifications, if any, are required in the method you have described from the circumstance that the milk is sour ?—We ascertain the degree of acidity in the milk by means of an appropriate alkaline solution, and we determine the acidity in one sample, and, according to the acidity of the milk we add so much of an alkaline solution of strontia for the purpose of neutralising the lactic acid which would otherwise—at least, a portion of it would—be removed by the ether which is used in the maceration process. That is really the only modification which is necessary in respect to the application of the method.

10579. Would you tell the Committee whether there is any difficulty, chemical or mechanical, in the analysis of sour milks ; and if there is, under what conditions there is a chemical or mechanical difficulty ?—In an ordinary way—that is to say, in a sample that has been taken in the manner which is laid down in the regulations of the Local Government Board issued to the inspectors, we find that the only change which takes place is the production of acid in the milk. So long as that is the only change together with the production of a minute quantity of alcohol there is no difficulty at all in determining what the original composition of the milk was.

10580. I will take you on that point later ; but we will begin with the initial difficulty that it is alleged that because the milk is more or less clotted in virtue of the casein having been precipitated by the formation of lactic acid, there is a mechanical difficulty in operating with the fluid, which affects the accuracy of the results. Would you kindly say how far that is or is not so ?—There are no grounds whatever for that statement. The milk is thrown out into a large vessel, which contains the whole contents of the bottle, and a very little whisking of the contents reduces it to a fine state of division in such a way that the fat is completely mixed in the sample and, indeed, is even more stable than the fat is in milk which has never soured at all. I should, speaking for myself, quite as readily—perhaps, even more readily—analyse a sample of milk which had soured even than one which had not soured at all. I think there is a quicker separation of fat even in new milk than there is in the fat of milk that has become sour, because the fat is distributed and remains stationary in the kind of syrupy condition into which sour milk has been brought.

10581. (*Chairman.*) The statement I put out the other day when Professor Thorpe was absent, that he would as soon make an analysis of sour milk as of fresh milk is borne out and corroborated by yourself ?—I quite agree with that.

10582. (*Professor Thorpe.*) You tell the Committee there is no practical difficulty in the analysis of sour milk, and the allegations which have been made that your method, or what we may call the maceration process, is attended by the retention of a small quantity of fat, or, as alleged by other people, a small quantity of water in the milk solids are not borne out at all ?—No, they are not.

10583. Now, you have described how you determine the fat and the non-fatty solids ; there is, however, one little difficulty ; the milk, as the Committee has heard, is sour. Can you tell us very briefly what is the chemical nature of the souring process overtaking milk ?—The principal alteration of the sugar which affects its weight, is that due to alcoholic fermentation, and as the main product of this change is alcohol, easily recovered by distillation and quantitatively determined, we are enabled to refer this product back to its equivalent in milk sugar, and a close approximation of the true weight of sugar lost is thereby ascertained.

10584. The main thing, therefore, is the change of hydrated milk sugar into alcohol and carbonic anhydride ?—Yes, that is the chief change which affects the original weight of non-fatty solids.

10585. Now, the nature of this change is fairly well known, is it not ?—It is very well known.

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10586. And it appears that 360 parts of hydrated milk sugar will yield 184 parts of alcohol, and be accompanied by the elimination of 176 parts of carbonic acid ?—Yes, these are the theoretical relations.

10587. So that, if we determine the amount of alcohol in the liquid by well known and by accurate processes, inasmuch as 184 parts of alcohol are equivalent to 360 parts of hydrated milk sugar, we can, of course, calculate back again the amount of milk sugar which was initially present ?—Yes.

10588. There are other changes in the souring of milk which take place, are there not ?—Yes.

10589. What are they ?—The slight alteration in weight, consequent on the hydrolysis and conversion of milk sugar into lactic acid, and the formation of certain so-called bye-products of alcoholic fermentation are partly positive and partly negative in direction ; but their joint effect is too small to have any appreciable influence on the result. A slight loss also occurs through the alteration of the casein or proteid substance in the milk, due principally to the conditions which arise during fermentation changes. Although the amount of the loss due to this cause is very small the attempt is made to estimate its extent by the determination of the ammonia, or ammonia compounds produced as shown by the application of the Nessler test, and calculating the ammonia indicated into its equivalent in casein.

10590. In other words, it appears that at least 7-10ths of the total loss of matter which takes place in the souring of milk is due to the conversion of lactose into alcohol ?—Yes.

10591. And inasmuch as that change is accurately known, it is possible to calculate as you have told us the original quantity of lactose which has suffered the alcoholic change ?—Yes.

10592. The change in the amount of casein you tell us can be approximately estimated by the amount of ammonia to which it gives rise ?—Yes.

10593. In other words, then, we can build up the greater portion of the milk matter which has suffered change ?—Yes.

10594. Does the fat suffer change ?—No change occurs in the fat.

10595. In the first place, what is the necessity of making this determination of alcohol, or the other determinations which are made ; what is the necessity of taking any cognisance of those in the analysis of sour milk ?—These changes have resulted in a diminution of the original solids to an extent which is represented by these changes, and as these can be very accurately determined it is easy to resolve these figures again into weight, which, added to the solids represented in the residue you have before you, gives you the original non-fatty solids in the milk.

10596. Inasmuch as a charge might be based of dilution with water, on a loss or presumed loss of weight of the non-fatty solids, it is necessary to have regard to the slight alteration of the lactose, and of the other constituents, with a view of determining what was the initial quantity of non-fatty solids there ?—Yes, that is quite so ; that is to say, if we found 8 per cent. and the alcohol in these other products reached 3-10ths, we add on the 3-10ths to the 8, and we say the milk originally contained 8·3.

10597. Now, the validity of this method has been determined in the laboratory by a series of analyses made over a long period of time of milk of known composition which has been kept ?—Yes.

10598. Would you kindly explain to the Committee what is the teaching of those analyses ?—The conclusion to be drawn from these is this, that we can determine within a few hundredths of a per cent. the actual change which has taken place in the milk by keeping. We determine the non-fatty solids and the fat in the new milk—keep it for a certain amount of time, and then determine the loss—by the process already indicated. When we compare the calculated loss with the actual, these amounts are so near that they are in fact in many cases within the errors of an experiment. So that we are able to say that this method is valid, because when we apply it to a large series of milks, the loss is accounted for by the determination of those products of change which are found directly in the milk which has been kept.

10599. In the tables on page 4 of your memorandum

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that is summarised, and perhaps you had better explain it. Take No. 1, for example, that is a fresh milk is it not?—Yes, it is a fresh milk which gives non-fatty solids of 8·97 and fat 4·08.

10600. That milk was kept for how many days?—Twenty-one days.

10601. The non-fatty solids in it were then determined; what were they?—8·71.

10602. The fat being how much?—4·02—within 6-100ths.

10603. There is a loss of non-fatty solids there of what?—There is a loss of 0·26, but when we determined the alcohol and the acetic acid, which was produced by the oxidation of the alcohol, we were able to account for 0·2 out of the 0·26 which had actually disappeared.

10604. Take another, you need not run through the whole table?—The next will give a better comparison. There the actual loss is 0·23, but we accounted for 0·21, so that if we knew nothing of the change we should have added on 0·21 to 8·74; in that case we would have got 8·95 instead of 8·97, which was the original content of the milk.

10605. Take the extreme case, where the milk was kept for 102 days?—I think that is very striking, and I would like to make an observation here. It may be incidentally stated in support of the general validity of the process for the determination of the amount of loss in milk kept for short periods, that when it is applied to milk samples kept unopened for a period of over one year, and in which nearly the whole of the milk sugar had suffered alteration—a considerable proportion having been converted into alcohol—the results obtained after accounting for the changes which had occurred, were nearly as concordant with those of the original milks as though they constituted duplicate analyses of the same sample in the fresh state. I would point out that under the head of separated milks, to which approximately 10 per cent. of water has been added, which perhaps shows this more clearly than elsewhere, if we take 1A, we find that the original non-fat was 8·18, and when examined after a year and twenty-two days the non-fats then weighed only 6·71; but on applying these corrections on the principle already indicated, we found we should have calculated that the loss was 1·50, but the actual loss is 1·47, so that instead of 8·18, we would have stated that this milk contained 8·21; that is to say, we are within 3-100ths of the original contents of the milk after a year and twenty-two days. I think that is very important, because it shows that the lines upon which the correction is made must be sound, otherwise it would have been impossible after so long a period as this to have determined the original non-fatty solids.

10606. I suppose we never keep the milk or have milk sent to us a year and a half old?—No.

10607. What is the general length of time which intervenes—From about twenty-one days to a little over a month; but that period will become even less because there is a desire to bring on the cases earlier than formerly.

10608. It would not really matter to us, assuming that the sample were securely sealed and properly kept, whether it was twenty-one days or almost twenty-one months, would it?—No it would not. I think that that is very important, because it bears upon the preservation of the sample, and the precautions the inspector ought to take in preserving the sample. It is very helpful when the bottle is full and kept under favourable conditions.

10609. (*Major Craigie.*) There are certain other differences between the calculated and the actual loss, which are considerably greater than those which you have mentioned to the Committee; for instance, No. 10 and No. 11 on the first page of that table, where the difference is between 0·76 and 0·87, and 0·41 and 0·33; are there any special reasons why the difference between the calculated and the actual are so considerably greater than they are in the others?—If you take 0·41 and 0·33 that is only 8-100ths of a per cent.

10610. But then there is the 0·76 and the 0·87?—The two fats there differ by 6-100ths, and accounts for so much of the total difference; the fat was more successfully extracted there to the extent of 6-100ths of a per cent., which, of course, tells against the other result; you have to deduct the 0·6 from 0·41 to get the absolute loss, and that reduces it to 0·35.

10611. Would that apply also to No. 8, where the difference is between 0·35 and 0·27?—Yes; it is in the fat.

10612. (*Dr. Voelcker.*) It means you did not get the fat out so well?—In that particular case, yes.

10613. (*Professor Thorpe.*) These variations among themselves are not substantially greater than duplicate analyses of the same milk when fresh would have given?—These are equal to those which the same analyst might find in his own analyses, but they are less than what different analyst might find if they had the same milk to analyse.

10614. It does not make any difference, does it, whether the milk be mixed with water or not, as to this correction?—No.

10615. It does not make any substantial difference?—No.

10616. Would you kindly tell the Committee what in actual practice is the amount of this aggregate correction to be made upon the results of the non-fatty solids?—It amounts to about 25-100ths—sometimes it is even a little less. In summer the amount is greater than in winter, because in a milk that is kept in cold weather the sugar simply changes into acid, that is to say, the sugar changes into lactic acid only. There is very little other change during cold winter months in milk kept in the hands of some inspectors. In summer the alcoholic fermentation is more liable to take place, and therefore the change is greater. We therefore find that in August and September the amount of change is greater because the alcoholic change is more considerable on account of the increased temperature; but, in that case, we only find from about 0·45 up to about 0·65 of loss, making an average of about 3-10ths to 4-ths all through the year.

10617. You hand in, I understand, a table which shows the list of corrections which have actually been made during the years 1894, 1895, and 1896, in such reference milk samples as we have had to deal with in the Government Laboratory?—Yes. (*See Appendix* No. XXIX.)

10618. The Committee will glean from that table, which is the last of these series, what are the actual amounts that are in question?—Yes. Those figures have been added to the non-fatty solids. They are all separate experiments. Every figure there represents a reference sample.

10619. We have a certain amount of experience of the analysis of condensed milk in the Government laboratory?—Yes, both sweetened and unsweetened.

10620. Those are samples which do not come to us mainly as reference samples, do they?—No, these are submitted by Government Departments under contracts.

10621. Do you hand in a table showing the list of analyses of condensed milks of various brands supplied to the Government service?—Yes. (*See Appendix* No. XXVIII.) The table shows the analysis of samples of condensed milk in which the degree of concentration is calculated from the proportion of non-fatty solids on a basis which assumes that the original milk contained 8·9 per cent. of non-fatty solids. From the results obtained at the Government laboratory, and the numerous published results of the mixed milks of large dairies, and considering that condensed milk must represent the mixed milk of many cows, the above basis is regarded as equitable. For the same reason I am of opinion that the limit for fat in the original milk used for the purpose of condensation should be fixed at not less than 3·25 per cent. The effect of this limit in the case of milk condensed to one-third its weight would be to require that the condensed sample should contain not less than 9·75 per cent. of fat.

10622. (*Chairman.*) Is that the standard now used in Somerset House for condensed milk?—No.

10623. (*Professor Thorpe.*) We have no standard, as a matter of fact, in respect of condensed milk?—No.

10624. We have to determine whether the specification issued by the particular office for which these things are tendered is carried out?—Yes.

10625. They specify that it shall not contain less than 10 per cent. of fat?—Yes. We have samples under the new Food and Drugs Act which we have to consider according to a standard or limit. We cannot rise so high, I think, as we should like until you have decided something on that point, and we are not inclined, until you have recommended another figure, to use higher than 3, calculated upon the original normal milk.

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10626. Your opinion is that it ought to be higher?—I think it ought to be raised.

10627. Would you suggest 3·25?—Yes, 3·25.

10628. And the non-fatty solids?—The non-fatty solids in that case, of course, would not be reckoned, because there is no question of watering; it is only a question of fat. We use the 8·9 because that is the average not only for our own work, but of nearly all the best analyses of milk.

10629. (*Major Craigie.*) You insert that as a common figure for the whole?—Yes, it is used as a common figure, and it is very fair. If we took the figure which Mr. Lehmann takes for his non-fatty solids we would raise our normal proportion of fat in the milk rather than reduce it; which would be in favour of the manufacturers of condensed milk, because it tends to reduce the figure, or assumes a somewhat lower figure in the new milk, than actually might have been there if the non-fatty solids had been taken at 8·5 or 8·4.

10630. What is the number of analyses?—Twenty-five altogether.

10631. (*Professor Thorpe.*) Is there anything else you desire to bring to the notice of the Committee?—In regard to sugar in condensed milk, I am more than ever convinced that something ought to be done, after hearing the evidence this afternoon, in the way of a limitation of sugar in condensed milk. I think that the taste of the public has been largely vitiated in that way, and that it is detrimental to the public interest that so large a proportion of cane sugar should be permitted in condensed milk. One of the difficulties of using condensed milk for children is that you cannot dilute it to such a point, to such a small dilution as would give you milk that would be palatable on account of its sweetness; but if the amount of cane-sugar were considerably reduced you might then dilute condensed milk containing sugar to such a proportion as would give you good milk such as could be given to a child. At the present time, when you add to the cane-sugar, which is nearly 40 per cent., the 13 or 14 parts of milk sugar, you get something like 53 or 54 per cent. of total sugar in something which only contains total solids equivalent to 75 per cent. I think that is out of all proportion, and it would be greatly to the public interest, if you could limit the cane-sugar under the provisions of the 4th Section, which I think you can, because it speaks of "extraneous matter."

10632. (*Mr. Murphy.*) Have you anything to say about the amount of condensation being declared on the tin, which has been suggested here?—I do not think that there is any necessity for that at all. The condensation is between 2¾ and 3¼. That is about the range, and I do not think it would be worth while to have any provision of that kind, and it might not be practicable. The manufacturer may not quite know himself what he is producing, and it would be very difficult indeed to declare it. I do not think you would be very much better with it, because it really would not matter whether it were a 2¾ condensation or a 3¼ condensation. The point is the amount of milk constituents in it after it has been diluted.

10633. (*Major Craigie.*) If it was four times condensed, as we heard it suggested here to-day?—That requires explanation. (*See footnote to Q. 10296.*) I think there is a mistake there. I imagine Mr. Lehmann meant that it was reduced to a fourth of the bulk. Those are two quite different things. The condensation in the table refers to weight only, but I think in Mr. Lehmann's mind it was one-fourth in volume.

10634. He spoke of 23 and 25?—You can get his ratio if you take the density of the milk as it stands into consideration. The density of condensed milk is as 1·3 is to 1, taking water as unity. Therefore the ratio of 1·3 to 1 is the same really as 3 to 4. That is how it comes in. You require to have regard to the volume which it occupies as against the weight. It is three times when you speak of it in weight, but it is one-fourth when you speak of it in volume, because the ratio of the density is in that proportion. I think that is the explanation of its being one-fourth.

10635. (*Professor Thorpe.*) Have we in the Government Laboratory occasional samples of cream referred to us?—Yes.

10636. What is the charge there in the case of cream under the Food and Drugs Act?—I cannot recollect a case. I thought you referred to our general knowledge of creams.

10637. No, I meant under the operation of the Food and Drugs Act. Do we not receive samples of cream under that Act?—No. I think there has been a great difficulty in the minds of analysts about dealing with creams. I do not think they do it.

10638. Do you think that fact that we do not get samples referred under the Food and Drugs Act arises from the difficulty of analysts in dealing with it, or does it arise from the fact that there does not seem to be any public demand for any action to be taken in the matter of cream?—There is not a very great demand on the part of the public in regard to the quality of cream.

10639. Do you mean, roughly speaking, that perhaps the public takes care of itself in the matter of cream?—I think very largely it does so. I have no doubt analysts find a difficulty because no kind of recognised standard even among themselves has been declared, and really, therefore, they do not know very well how to deal with the matter.

10640. Do we get many samples in the Government Laboratory of skimmed milk?—Yes, we have a fair amount of experience in skimmed milk—not a great many samples.

10641. What is the charge there in the case of skimmed milk?—That the proportion of fat was too low for milk under the denomination of skimmed milk.

10642. The charge practically was that separated milk had been substituted for hand-skimmed milk?—Substantially that was the charge.

10643. Do you think that the public interest requires that the definition of a standard of hand-skimmed milk as against separated milk should be set up?—I do not think that the interest is so large as to require anything of that kind. The great difficulty would be in fixing any figure that would be satisfactory. It ranges within our knowledge from 0·5 per cent. of fat to over 1 per cent. If you gave way on that question in suggesting 0·5 as your limit for skimmed milk it would not be worth while, because you can get separated milk at 0·5. I think that difference is not sufficient. If you raised the standard up to 1 per cent. there would be something gained by it, but if you were to take a very well-skimmed milk as your standard you really would be doing nothing.

10644. (*Chairman.*) Would it not be a good thing to have a standard for separated milk of solids not fat, in order to prevent the addition of water?—That follows, I think. You would calculate your non-fatty solids in a case of separated milk. We have done so; we simply allow for the proportion of fat that has been removed, and raise the non-fatty solids figure accordingly.

10645. (*Dr. Voelcker.*) You would have a figure?—Exactly.

10646. What is your figure?—It would be about 8·9, or thereabouts.

10647. (*Chairman.*) We have had it recommended that if anything is done in that direction it should be taken at 9?—It is scarcely necessary, because it is involved in the question of your non-fatty solids figure for normal milk. You have only to resolve it into what that milk would give if separated, and that is a mere arithmetical calculation; you really do not require a declared standard at all for separated milk. When we get a very rich milk we make some allowance for the excess of fat in calculating what the non-fatty solids in the milk are; so if we get 8·4 with a great deal of cream or fat, we should regard that to have been equivalent to 8·6 or 8·5, as the case may be, in milk with fat in normal proportion.

10648. (*Major Craigie.*) With reference to a question that came up, I think, one day when Professor Thorpe was not here, on the nature of the bottles that were sent up to the Somerset House Laboratory, have you had any specific complaints as to the manner in which the samples were rendered to you so as to interfere with the analysis afterwards?—Yes; we ourselves have complained.

10649. You have had cause to make complaint of the manner in which samples are presented for analysis?—Serious complaints; and we have drawn the attention of the magistrates' clerk sometimes when it has been serious. We have observed occasionally that the cork had been pierced when we drew it. We are very care-

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ful of drawing a cork, if we suspect anything, to pull it out without going through with our own corkscrew, and then examining to see if it had been previously drawn. In one instance, we found that that was the case. We detected it and called attention to the matter, and the inspector said that he had done so; he thought that he was doing right, because the bottle was very likely to burst if the gas inside were not allowed free play; and therefore he withdrew the cork, as he said, to allow the gas to escape, and then reinserted it.

10650. May I take it that you would be glad to see if it could be managed that some regulation as to the precise character of the bottles or the manner of securing them should be established by a central authority, to which the local authorities might be made to conform?—Yes; if you could get that power.

10651. Or at least that the Central authority might advise by circular?—Something has been done on the initiative of the Government Laboratory in the way of getting the Local Government Board to issue a circular.

10652. There is a circular in existence suggesting the method by which the bottles should be sealed?—Yes; as to the quantity of sample and the manner in which the bottle is to be secured. One very notable point is in the fourth instruction. "The bottle used for the reserved portion of milk should be of such capacity that the milk may nearly fill it." If you give us that and well cork it we have no difficulty whatever, no fear at all of not returning exactly the contents of the original milk.

10653. (*Professor Thorpe.*) And there is no fear of bursting the bottle under those circumstances?—No.

10654. (*Major Craigie.*) Is there any difficulty about the seal not being sufficiently secure and covering the top of the bottle?—Yes; I think we have noticed sometimes across the wax that it seemed very much like a sixpence that had been used for sealing it, or the button of a constable's coat. I think there ought to be some regulation or suggestion as to securing samples.

10655. There ought to be an official seal visible?—Yes; something very distinct. In the large number of cases it is so. They are very much more careful now than formerly, and also much more careful in the selection of the bottle and as to its cleanliness. It is a very remarkable thing that when we started first we found very much larger differences—much more alcoholic fermentation—and we put that down to the want of cleanliness and care in the selection of the bottle, and partly perhaps because milk twenty-five years ago was not as carefully kept in the hands of the distributor as it is now.

10656. When was that circular to which you refer issued?—It was issued in February, 1894.

10657. And it is since that date that matters have improved?—Yes; we have felt the benefit of this.

10658. But you would think that some further improvement is still capable of being effected?—I think another reminder would be of very great use indeed, especially as regards the size of the bottle. In the south of of England, including Hampshire and some other parts, we get bottles with very wide mouths, and, as a matter of fact, they are not sufficiently secured. I think some evidence was brought here which I think I could corroborate, though I would not like to say the particular district from which it came—I think, perhaps, it would not be fair—but we have had bottles similar to that which was referred to by one of the witnesses to-day.

10659. You heard to-day the case of the Wiltshire Bottle, which was a most awkward bottle?—Yes; and in other parts of the South of England especially we have had bottles of that description where the cork is far too large, and the opportunity of sealing is not nearly what it ought to be.

10660. Have you had any complaints brought to your notice of the quantity which is required to be supplied of a sample of milk?—Occasionally. It has been suggested that a smaller quantity might have been taken—whether we could not do with a smaller quantity.

10661. Are you of opinion that you could do with a smaller quantity than a pint?—Yes, we could; it is more difficult for us to do with a smaller quantity than the public analyst. I will tell you what occurs to me. Supposing that the Food Preservatives Committee issues some regulation with regard to boric acid which imposes the analysis of the proportion of boric acid in milk: in that case, you would require perhaps two duplicate analyses, and at least 30 or 40 c.c.'s of milk for the determination of the quantity of boric acid. If such a thing happened, and you were to restrict the quantity of milk to be taken, you would almost put it out of the power of the public analyst to save sufficient for a boric acid determination.

10662. On the other hand, you heard the difficulty which inspectors have suggested to us, that if the inspector makes a demand for so large a quantity as a pint of milk in certain districts where people are in the habit of buying only single pennyworths, it at once reveals the character of his purchase, and there is a difficulty there?—I do not quite sympathise with that. A pint is only 2d., and the difference between 1d. and 2d. I think is so small that I really do not think there is very much in it. I should almost say that it is because it is more convenient to carry fewer and smaller bottles, and not to have so much trouble with bottles of such a large size. Then there is another reason why I do not think it is a valid objection. The inspector goes into the shop, but the vendor has not got this poor milk behind his counter. He has it upon his counter, and the inspector may choose any milk that he sees before him for the purpose of purchase; and I do not see how he can fail getting the poor milk if the vendor has milk of that description. I do not see where the difficulty comes in.

10663. If the inspector goes up to a man with a barrow or cart, where he has two or three cans of milk—cans which differ possibly in the quality of their contents—and he asks for a pint, may he not be served out of a certain can of which the contents are of good quality, whereas if he asks for a smaller quantity he might not be detected as an inspector and would be served from the lower quality can?—He has the power to indicate which of those he will have; he does not leave it to the vendor. He may require any of those samples himself. So I cannot find any difficulty in the suggestion.

10664. In going to a man selling milk from a barrow in a street with two or three cans he could not tell which can was of a better quality than another; the man who takes the barrow would know, the inspector would not. Would not the demand for the larger quantity suggest caution to the vendor, who would, therefore, give the better milk? Is there not a possibility of that?—I do not think it amounts to very much, because, as I said, the inspector may choose his own milk and the can from which he may take it, or he may take all three samples. If you were to bring it up that he had one that was bad and one that was good, I think that would tell much more against the vendor before the Court.

10665. (*Chairman.*) The witness that we pressed on this question said the vendor got out of it at once when he suspected a particular vessel—"I want it out of that vessel." "Yes," said the vendor, "You can have it, but that is skimmed milk"—and he was done at once. Whenever he wanted a suspicious article that is the way he was put off: "That is skimmed milk"?—But that could always occur; that would occur in any shop. I do not think that objection has ever prevailed very far.

10666. (*Major Craigie.*) You have not had it brought to your notice?—No, I have not.

10667. (*Chairman.*) The gentleman who came here to represent the sanitary inspectors, told us that really the adulteration that was practised among the poorer classes of the people was absolutely untouched now, in consequence of this one point being insisted on; that is what he told us in this room?—I cannot see how that can be, for those reasons that I have given—namely, that the inspector can choose the churn from which he may be served.

10668. He is always met with that answer at once: "If you want it out of that particular churn or vessel, you can have it, but that is skimmed milk"?—I do not see how that applies, because the inspector does not look like a poor man. The poor man is recognised as such, but the inspector would scarcely be recognised as a poor man.

10669. (*Major Craigie.*) The inspector very often employs an agent, and that agent is told that she must ask for at least a pint, whereas the poor girl or woman he sends in, if she asked for a smaller quantity, might not raise the suspicion, which the larger quantity would?—The inspector is entitled to his opinion of it. I do not see that there is anything in it.

10670. After your experience of the working of the Acts on the present standards, which you have described as

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having been gradually raised from 2·5 to 2·75, and thereafter to three, as regards fat, I understand, speaking from a business point of view, that you would prefer that this Committee should either confirm that highest standard or suggest a higher standard; but, in any case, that some standard should be prescribed by regulation under Section 4?—Yes, undoubtedly.

10671. That is quite your opinion?—Yes. I think that you might adopt something that is even higher—I incline to that view. I do not know whether the Committee has had before it the particular wording of the Act, or whether it has been discussed in any way; but you will notice the fourth section does not say anything about the limit or standard.

10672. The fourth section leaves us to determine what is "deficiency"?—Exactly—in relation to normal milk. I do not know that it is a standard that you have got to determine. You have rather to determine what are the figures for normal milk, and then to say what deficiency of the normal constituents shall raise a presumption of adulteration. Of course, this is a kind of *obiter dictum.* I am not a lawyer, but in looking at the thing it seems to me that you would have the question to consider.

10673. That would be dealt with by the form in which the regulations would be drawn?—If you adopted a limit I apprehend that that is where the deficiencies would come in; because you are to determine what are the normal constituents in milk, and then what deficiency shall constitute the presumption. So that I think you ought to take something like 3·25 of fat at least for normal milk, and 8·5 of non-fatty solids. This is what I should regard as normal milk. The question, then, would be the deficiency which shall determine the adulteration.

10674. You would suggest, then, to the Committee, from your experience, that the constituents of genuine milk in its normal condition should be defined by regulation to be 3·25 of fat, and 8·5 of non-fatty solids?—Yes, these are constituents of normal milk, and it is for the Board of Agriculture to determine the deficiency that would raise a presumption of adulteration.

10675. This Committee have to make regulations, and you would suggest that the Committee may make a recommendation after passing that general recommendation that we might have a certain different figure below that—say 3·15?—Of course, there would be no determination of adulteration until you did come below.

10676. Is it not sufficient to say that if you declare 3·25 to be the normal state of matters, any fraction below 3·25 raises a presumption?—The Board of Agriculture have to make the regulations in determining what is "deficiency." I can imagine the Board of Agriculture saying, "No, we shall not say a deficiency arises at 3·2. We shall say that the deficiency arises at 3·1."

10677. I perfectly see your point?—That is what I want to get at—the point at which you will begin to bring a charge against the man, because, after all, that is the most important question.

10678. (*Professor Thorpe.*) I would venture to point out to you that looking at it exactly from your point of view as to the normality, normality practically means the average composition of milk?—True, I quite go in with that.

10679. If the average composition of milk is to be, so to speak, your datum line, then, from your point of view, the average composition is normal milk, and on the theory of probabilities it must be?—That is not quite my meaning. For instance, I will take this case, and it deals with the suggestion which Mr. Maskelyne made. If I get non-fatty solids of 9·5, the normality of the fat would not be less than 3·5; the normal non-fats determine what the normal fat is—that is, within certain limits.

10680. (*Major Craigie.*) There seems to be a variation between the two?—Yes, so it might be, and it is within your province, or the province of the Board of Agriculture, to say that if the milk gave 9·5, the corresponding normal fat for that is 3·5; so that you have the two qualities not determined by an arbitrary standard, but one resting upon the other—the normality of the fat depending upon the high normal figure of your non-fats.

10681. (*Professor Thorpe.*) May I point out to you what the practical effect of that suggestion is—that you would lead not only to the abstraction of fat in the case of rich milks, but you would also lead to the addition of water?—The ingenious person would no doubt take that view of it; but there is a slight safeguard in this, that if he began tampering with his milk, and did not know what his non-fats were, he would bring himself in for watering; there is a probability that he would.

10682. (*Major Craigie.*) You are not proposing to suggest a standard or declaration of normality with reference to fat alone; you would always propose to have both the fat and the non-fatty solids taken into account on any declaration?—That is my own personal opinion. I am only speaking now what I think about this matter. Those two things do seem to hang together, high non-fats with a high fat; and, consequently, when I got 9·5 of non-fats in the sample that was referred, I was perfectly certain that it must have had at least 3·25 of fat originally, with a non-fat of 9·5; and, therefore, we had no doubt at all about saying that the sample had been deprived of part of its fat. But, of course, I merely state that to illustrate what I mean by the question of normal milk and the position which the Board of Agriculture might have to take in defining what is deficiency.

10683. I wanted to get exactly what your own view was of the idea of a standard, and how it would work in a laboratory?—Of course, it would work amongst analysts in this way, that if you did take 3·25, neither they, perhaps, nor the local authority, would proceed for a tenth of a per cent. underneath that figure.

10684. There would always therefore be a margin, a sort of working standard?—Yes, and I am not sure whether that is not the correct interpretation of the 4th section. But that is a question for a lawyer, and not for an analyst.

10685. (*Chairman.*) If you take 3·25 and 8·50 as your datum line, what amount of latitude would you allow to the milk seller?—It is there where the difficulty comes in. It seems to me that if you take 11·75, and require that all milks should not be less than 11·75 total solids, of which 3 per cent. was fat, you would really get your 3·25; it would be involved in that. In that case the 3 per cent. would be the absolute limit, and that would determine the deficiency.

10686. (*Major Craigie.*) Absolutely?—Yes.

10687. (*Chairman.*) 11·75 of which not less than three would be fat?—Yes.

10688. That you have in your mind as an ideal standard for the country?—I think so. I think it is better than 9 and 3, because by what I have said already normality does not come in there—at least in my own personal view, and comparing it with the figures.

10689. (*Professor Thorpe.*) What you mean is that 9 and 3 is not a natural ratio?—Exactly.

10690. (*Dr. Voelcker.*) Practically, you do not think that this Committee need consider any qualification of the standard, because of the difference in the methods practised by analysts of standing at the present time?—No.

10691. Although you would naturally prefer your own process, you would not claim for any one process more than a slight preference over another, and this might very well be due to individual opinion?—What processes have you in view?

10692. Processes for the analysis of milk?—I would not like to say that of all. I would scarcely include the centrifugal methods.

10693. I am not speaking of these; I was confining my remarks to processes which we have had described in evidence, and which public analysts would use in cases of prosecution—the Werner Schmidt would be one, and the Adams process would be another?—I quite admit that we think a great deal of the Werner Schmidt process. I have compared some 60 of 70 samples done by the Werner Schmidt against our maceration process, and the average difference of the whole only amounts to 0·03, so that personally I greatly commend the Werner Schmidt.

10694. On behalf of Mr. Farmer I wish to ask you whether the fact of the addition of half a per cent. of fat to a milk containing naturally 3 per cent. of fat, could be detected by the analyst?—If I understand that in the sense in which it is put, I should say, no. As it appears to me you cannot tell whether that 3·5 was all in the original milk, or whether it was originally 3·0, and 0·5 was from added cream. I do not see how that is to be detected. It would only alter the non-fatty solids to so small a degree as to be well within th

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range of non-fatty solids in genuine milks, and you could predicate nothing with regard to it.

10695. (*Major Craigie.*) Where the fat, in fact, came from two sources?—Yes; I do not see that you could tell that.

10696. (*Dr. Voelcker.*) If a more considerable amount of fat were added, then you would come to a point where you would reach abnormality, and you might be suspicious?—We reached it in the Mentmore cows; I could not tell whether it was added cream, or whether it was as the cow gave it. I rather take Mr. Farmer's view of it that it cannot be done.

10697. You could not employ that to an unlimited extent?—No, there is a limit beyond which no doubt you could detect it.

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APPENDIX No. I.

Handed in by Dr. ALFRED HILL. (Q. 13.)

Analyses of Milks from single Cows of Birmingham and District.

TABLE 1.—AVERAGE COMPOSITION.

——	Total Solids.	Fat.	Solids not Fat.
111 Birmingham samples	13·0	4·2*	8·8
120,540 samples (Vieth)†	12·9	4·1	8·8
55 Dairies (Bell)‡	13·0	4·0	9·0
273 Cows (Bell)‡	12·9	4·0	8·9

* Calculated from specific gravity and total solids by Richmond's Formula. "Analyst," xix., 81.

† "Analyst," xvii., 35.

‡ Calculated from data given in the Report of the Local Government Board for 1893–94.

TABLE 2.—TOTAL SOLIDS.

Percentage of Total Solids.	Number of Samples.	Percentage of Samples.
11·18—11·49	6*	5·4
11·50—11·99	11	9·9
12·00—12·49	15	13·5
12·50—12·99	27	24·4
13·00—13·99	37	33·3
14·00—14·99	12	10·8
15·00—17·01	3	2·7
TOTAL	111	100·0

* See Table 5, numbers 1–6.

TABLE 3.—FAT.

Percentage of Fat.	Number of Samples.	Percentage of Samples.
2·36—2·79	4*	3·6
2·80—2·99	3†	2·7
3·00—3·19	6	5·4
3·20—3·49	14	12·6
3·50—3·99	16	14·4
4·00—4·99	52	46·9
5·00—5·99	8	7·2
6·00—8·44	8	7·2
	111	100·0

* See Table 5, numbers 2, 3, 4 and 7.

† See Table 5, numbers 5, 8 and 9.

TABLE 4.—SOLIDS NOT FAT.

Percentage of Solids not Fat.	Number of Samples.	Percentage of Samples.
7·61—7·99	6*	5·4
8·00—8·29	5†	4·5
8·30—8·49	13‡	11·7
8·50—8·69	16	14·4
8·70—8·99	38	34·3
9·00—9·49	28	25·2
9·50—9·74	5	4·5
	111	100·0

* See Table 5, numbers 1 and 10–14.

† See Table 5, numbers 15–19.

‡ See Table 5, numbers 5, 6 and 20–30.

TABLE 5.—Analytical figures for all samples which contained less than 11·5 per cent. of total solids, or 3·0 per cent. of fat or 8·5 per cent. of solids not fat.

Number.	Total Solids per cent.	Fat per cent.	Solids not Fat per cent.
1	11·18	3·27	7·91
2	11·23	2·36	8·87
3	11·24	2·57	8·67
4	11·38	2·48	8·90
5	11·38	2·90	8·48
6	11·42	3·05	8·37
7	11·97	2·77	9·20
8	11·87	2·88	8·99
9	12·13	2·91	9·22
10	13·61	6·00	7·61
11	11·55	3·86	7·69
12	14·15	6·33	7·82
13	14·94	7·10	7·84
14	16·28	8·44	7·84
15	12·53	4·47	8·06
16	12·72	4·63	8·09
17	11·76	3·62	8·14
18	14·40	6·23	8·17
19	12·54	4·03	8·24
20	11·58	3·27	8·31
21	12·34	4·01	8·33
22	14·79	6·46	8·33
23	11·87	3·51	8·36
24	12·63	4·25	8·38
25	12·64	4·26	8·38
26	12·18	3·79	8·39
27	12·84	4·43	8·41
28	13·57	5·14	8·43
29	15·45	7·01	8·44
30	11·93	3·46	8·47

APPENDIX No. II.

Handed in by Dr. Alfred Hill. (Q. 307.)

Average Composition of all Samples of Milk Purchased under the Sale of Food and Drugs Acts, in the City of Birmingham.

Period.	Total Solids per cent.	Fat per cent.	Solids not Fat per cent.	Adulteration per cent.
1st Quarter 1894	12·2	3·7	8·5	9
2nd "	12·3	3·8	8·5	7
3rd "	12·0	3·5	8·5	26
4th "	12·5	3·8	8·7	6
1st Quarter 1895	12·2	3·8	8·4	24
2nd "	12·0	3·6	8·4	24
3rd "	11·6	3·4	8·2	28
4th "	12·5	3·8	8·7	4
1st Quarter 1896	12·2	3·6	8·6	19
2nd "	12·1	3·6	8·5	13
3rd "	12·2	3·8	8·4	12
4th "	12·4	3·9	8·5	12
1st Quarter 1897	12·2	3·6	8·7	8
2nd "	12·0	3·6	8·4	16
3rd "	12·1	3·7	8·4	18
4th "	12·4	3·8	8·6	14
1st Quarter 1898	12·2	3·7	8·5	19
2nd "	12·4	3·8	8·6	5
3rd "	12·2	3·8	8·4	12
4th "	12·6	4·2	8·4	9
1st Quarter 1899	12·1	3·5	8·6	17
2nd "	12·1	3·4	8·7	10
3rd "	12·2	3·7	8·5	20
4th "	12·2	3·7	8·5	21
Year 1894 - -	12·3	3·7	8·6	9
" 1895 - -	12·2	3·8	8·4	18
" 1896 - -	12·2	3·7	8·5	14
" 1897 - -	12·2	3·7	8·5	14
" 1898 - -	12·4	3·9	8·5	11
1899 - -	12·2	3·6	8·6	17

APPENDIX No. III.

Handed in by Dr. Bernard Dyer. (Q. 347.)

Supplementary Statement to Dr. Bernard Dyer's Evidence, pp. 10–19.

In my evidence I mentioned that 517 samples of milk analysed in my laboratory within the last few years, which passed the limits adopted by public analysts for genuine milk, averaged 12·50 per cent. of total solids, namely, 8·86 per cent. of non-fatty solids and 3·64 per cent. of fat.

I was asked during my examination whether I could state how many of these samples fell below 12 per cent. in total solids.

I have since been through the figures in order to ascertain this, and I find that, out of the 517 samples, 66, or more than 12 per cent., gave less than 12 per cent. of total solids.

I cannot vouch for the genuineness of these samples; they are merely samples that I considered to be genuine on the basis of the limits adopted by public analysts. In the great majority of cases, however, I should have no suspicion of their genuineness.

The results of the analyses of these 66 samples are appended hereto. They include 30 samples from Leicestershire, running from 11·95 down to 11·60; 20 samples from Wiltshire, running from 11·96 down to 11·60; 2 samples from the Essex herd which I mentioned, showing 11·92 and 11·90; and 14 miscellaneous samples, running from 11·93 down to 11·52.

Now these samples, I think, fairly illustrate the poorer kinds of milk which, as a matter of practical experience, are passed on a rigid application of the 8·50 and 3·00 limits; and it will be seen that it is only in comparatively rare cases that such samples fall as low as even 11·6. Of the 66 samples, 35—or more than one-half—are between 11·8 and 12·0 in total solids; and no less than 53 samples lie between 11·7 and 11·96 inclusive. Only two samples out of the whole 66 were below 11·6.

This appears to show that the application of the limits of 8·5 and 3·0 does not, as has been suggested, result in the passing of a large number of samples containing only 11·5 per cent. of total solids. It is rarely that milk is naturally so poor in both fat and non-fatty solids as to reduce the two figures simultaneously to the minimum limits. In fact it is probably only by mixing milk, water, and separated milk with nice adjustment, under scientific analytical guidance, that milk could be systematically brought down to 11·5 per cent. of total solids and yet pass the present minimum limits for both fat and non-fatty solids, namely, 8·5 and 3·0.

It will be seen that in every one of these 66 cases the fat fell below 3·5 per cent.; in 21 cases it was from 3·25 to 3·4; while in 45 cases it was below 3·25.

APPENDIX No. IV.

Handed in by Dr. Bernard Dyer. (Q. 347.)

Results of Analyses of 66 samples of milk containing less than 12 per cent. of total solids, and included in a total of 517 samples which were above the limits of 8·5 per cent. of non-fatty solids and 3·0 per cent. of fat. The 517 samples averaged 12·50 per cent. of total solids, viz., 8·86 per cent. of non-fatty solids and 3·64 per cent. of fat. The following were the samples which fell below 12 per cent. in total solids.

Total Solids.	Fat.	Non-fatty Solids.
30 samples from Leicestershire:		
11·95	3·40	8·55
11·95	3·30	8·65
11·95	3·30	8·65
11·95	3·20	8·75
11·95	3·10	8·85
11·93	3·40	8·53
11·91	3·29	8·62
11·91	3·10	8·81
11·90	3·40	8·50
11·90	3·40	8·50
11·90	3·20	8·70
11·90	3·20	8·70
11·90	3·10	8·80
11·90	3·10	8·80
11·89	3·35	8·54
11·88	3·01	8·87
11·85	3·20	8·65
11·85	3·15	8·70
11·80	3·30	8·50
11·78	3·24	8·54
11·75	3·20	8·55
11·75	3·10	8·65
11·75	3·10	8·65
11·73	3·10	8·63
11·70	3·20	8·50
11·70	3·20	8·50
11·70	3·10	8·60
11·70	3·00	8·70
11·62	3·15	8·47
11·60	3·10	8·50
20 samples from Wiltshire:		
11·96	3·32	8·64
11·93	3·40	8·53
11·90	3·35	8·55
11·85	3·20	8·65
11·85	3·00	8·85
11·83	3·30	8·53
11·81	3·00	8·81
11·78	3·20	8·58
11·78	3·16	8·62
11·76	3·18	8·58
11·71	3·20	8·51
11·71	3·18	8·53
11·71	3·07	8·64
11·70	3·20	8·50
11·70	3·10	8·60
11·67	3·00	8·67
11·65	3·15	8·50
11·61	3·03	8·58
11·60	3·10	8·50
11·60	3·10	8·50

RESULTS OF ANALYSES, &c.—*continued.*

Total Solids.	Fat.	Non-fatty Solids.
2 samples from Essex herd:		
11·92	3·35	8·57
11·90	3·30	8·60
14 miscellaneous samples:		
11·93	3·27	8·66
11·90	3·40	8·50
11·90	3·36	8·54
11·90	3·20	8·70
11·87	3·15	8·72
11·85	3·30	8·55
11·81	3·12	8·69
11·78	3·20	8·58
11·69	3·13	8·56
11·68	3·27	8·41
11·62	3·10	8·52
11·60	3·05	8·55
11·54	3·04	8·50
11·52	3·00	8·52

APPENDIX No. V.

Handed in by Mr. S. J. POCOCK. (Q. 1273.)

AN AGREEMENT made this day of between of hereinafter called the "Seller," who hereby agrees to sell, and Messrs. Freeth and Pocock, milk contractors, of Albert Embankment, Vauxhall, London, S.E., hereinafter called the "Buyers," who agree to buy the seller's dairy of milk from about cows up to The price to be

The seller also agrees to keep the milk at home for in the summer, if required. The milk to be delivered twice daily carriage paid to station, not later than a.m., and p.m., in such good condition so as to keep good a reasonable time after delivery, and in accordance with the following rules :—

1. That the bill be sent in every two, or four weeks, ending with Saturday's night's milk, and that payment be made within seven days from receipt of the same.

2. That all milk be sent perfectly pure and wholesome with all its cream as from the cows, and each and every consignment of milk to have a label attached signed by the seller or his representative, and bearing the words "warranted pure unskimmed milk."

3. That no pail rinsings or preservatives be put into any milk sent to the buyers.

4. That no milk be sent from a newly-calved cow until three days after calving.

5. That no milk be sent from any cow that is in ill-health or under physic.

6. That no mixed milk—that is of two different meals —be sent.

7. That all milk be cooled with a Dairy Outfit Co's. or Lawrence's refrigerator, directly it is milked (down to sixty degrees), winter and summer before being sent.

8. That the churns be found in equal proportions by the buyers and seller. The empty churns to be returned regularly, but the buyers shall not be held responsible for any delay in the delivery of the empty churns at the country station by the railway company.

9. That the churns and all dairy utensils be washed and cleansed in perfectly good and wholesome water, and the milk churns so placed that no dirt or foul smells can affect them inside or out.

10. That every churn be examined to see that it is perfectly sweet inside and clean outside before the milk is put into it.

11. That the milkers' hands shall be washed before milking, all the cows' teats shall be examined, and it necessary, cleansed before milking.

12. That no food shall be given to the cattle that shall deteriorate the flavour or quality of the milk and make it unsaleable.

13. That the seller shall send no milk except that produced on his own farm, unless by special agreement.

14. That the daily quantity sent in the shall be not than the daily quantity sent in the

15. That the buyers shall not hold the seller liable for breach of contract caused by epidemic disease among the stock or people on the farm. In such case the seller shall immediately advise the buyers, by telegram, and the supply shall instantly cease.

16. That the stock and dairy shall be conducted in every respect in accordance with the Acts of Parliament relating thereto.

17. That the buyers, or their representative, be at liberty to visit the seller's farm at any reasonable hour of the day, to inspect the stock and general arrangements, and see the cows milked.

18. That if the milk be deteriorated in flavour or quality, and does not keep a reasonable time after delivery, so that the buyers' customers refuse to pay for the milk, the amount to be deducted from the seller's account.

(Sign here)

Witness to the above Signature

APPENDIX No. VI.

Handed in by Dr. ASHBY. (Q. 1436.)

ANALYSES OF SAMPLES OF MILK supplied by farmers in the neighbourhood of Reading to purveyors of milk in that borough, between February 14th and March 5th 1900.

EVENING MILK.

Number.	Total Solids.	Fat.	Solids not fat.	Ash.	Specific Gravity at 60° Fahr.
	Per cent.	Per cent.	Per cent.	Per cent.	
1	13·44	4·06	9·38	0·79	1034·28
3	12·50	3·83	8·67	0·75	1031·66
4	12·51	3·45	9·06	0·76	1033·09
5	13·37	4·64	8·73	0·74	1031·35
6	13·39	4·91	8·48	0·72	1029·98
7	12·82	3·39	9·43	0·79	1034·42
8	12·50	3·67	8·83	0·74	1032·00
11	14·01	4·98	9·03	0·74	1032·22
19	12·07	3·38	8·69	0·77	1032·04
20	13·09	3·82	9·27	0·73	1033·48
21	12·06	3·32	8·74	0·72	1032·26
22	13·22	4·29	8·93	0·74	1032·38
23	11·60	3·10	8·50	0·77	1031·55
24	13·93	5·01	8·92	0·73	1031·19
Average	12·89	3·99	8·90	0·75	1032·28

MORNING MILK.

Number.	Total Solids.	Fat.	Solids not fat.	Ash.	Specific Gravity at 60 Fahr.
	Per cent.	Per cent.	Per cent.	Per cent.	
2	12·24	3·47	8·77	0·78	1032·29
9	14·25	5·18	9·07	0·74	1032·36
10	12·42	3·31	9·11	0·78	1033·70
12	11·68	3·01	8·67	0·75	1032·17
13	12·06	3·49	8·57	0·72	1030·81
14	11·77	3·02	8·75	0·71	1031·25
15	11·92	2·94	8·98	0·76	1033·59
16	11·54	2·86	8·68	0·72	1032·16
17	12·02	3·31	8·71	0·79	1032·00
18	12·52	3·32	9·20	0·76	1034·06
25	12·11	3·00	9·11	0·77	1033·86
Average	12·23	3·36	8·87	0·75	1032·57

Average of the 25 samples	12·60	3·71	8·89	0·75	1032·41

APPENDIX No. VII.

Handed in by Mr. STIRLING. (Q. 1774.)

A.—UNIFORMITY OF ANALYSIS.

Six samples of sweet milk, an exact duplicate of which was sent each to three Public Analysts.

The samples were taken in presence of, and sealed by James Stirling, Secretary and Manager, and Hugh Wilson Foreman, both with The Glasgow Dairy Co., Limited, on the 19th day of February, 1900.

——	Fat.	Solids not Fat.	Total Solids.
Sample No. 1—			
According to A, showed	3·75	8·77	12·52
,, B, ,,	4·06	8·75	12·81
,, C, ,,	3·90	8·64	12·54
Sample No. 2—			
According to A, showed	3·08	8·42	11·50
,, B, ,,	3·56	8·33	11·89
,, C, ,,	3·40	8·44	11·84
Sample No. 3—			
According to A, showed	3·58	8·98	12·56
,, B, ,,	4·44	8·36	12·80
,, C, ,,	3·90	9·03	12·93
Sample No. 4—			
According to A, showed	3·93	8·87	12·80
,, B, ,,	3·75	8·89	12·64
,, C, ,,	4·15	8·74	12·89
Sample No. 5—			
According to A, showed	3·61	8·94	12·55
,, B, ,,	3·46	8·91	12·37
,, C, ,,	3·90	8·90	12·80
Sample No. 6—			
According to A, showed	3·59	8·48	12·07
,, B, ,,	3·54	8·70	12·24
,, C, ,,	3·75	8·68	12·43
The differences in Butter fat between the highest and lowest returns are, viz. :—			
Sample No. 1	·31		
,, ,, 2	·48		
,, ,, 3	·86		
,, ,, 4	·40		
,, ,, 5	·44		
,, ,, 6	·21		

B.—SAMPLES DUPLICATED for the purpose of testing uniformity in Analysis.

——	Total Solids.	Solids not Fat.	Fat.
First			
Two samples of the same milk were sent each to Analyst A and to Analyst B; they were numbered 2 and 2 E.C. and 6 and 6R.			
No. 2, according to A, is	12·47	9·46	3·01
No. 2 E.C., its duplicate, according to B., is	12·12	8·92	3·20
No. 6, according to A, is	11·26	9·02	2·24
No. 6R, its duplicate, according to B, is	10·82	8·69	2·13
Second: A *versus* A.			
No. 9, according to A, is	12·36	9·33	3·03
No. 11, the identical of No. 9, according to A, is	13·53	10·47	3·06
No. 12, according to A, is	13·46	9·70	3·76
No. 13, the identical of 12, according to A, is	13·11	9·71	3·40
Third: A *versus* C.			
No. 28, according to A, is	12·22	8·79	3·43
No. 28W, the identical of 28, according to C, is	12·50	8·80	3·70
No. 33, according to A, is	12·57	8·77	3·80
No. 33W, the identical of 33, according to C, is	12·70	8·70	4·0
Fourth: C *versus* C.			
No. 1, according to C, is	11·90	8·90	3·0
No. 5, the identical of No. 1, according to C., is	11·50	8·80	2·70
No. 2, according to C, is	12·75	8·65	4·10
No. 4, the identical of No. 2, according to C, is	12·80	8·70	4·10

APPENDIX No. VIII.

Handed in by Mr. STIRLING. (Q. 1774.)

SAMPLES of MILK taken in September and October, 1894, for the purpose of ascertaining what would constitute a safe standard.

Sample Number.	——	Total Solids.	Total Solids not fat.	Fat.
	From Cow			
1	5 years old, 7 months calved	13·39	9·29	4·1
2	6 ,, 6 weeks ,,	12·47	9·46	3·01
3	4 ,, 4 ,, ,,	13·29	9·18	4·11
4	7 ,, 3½ months ,,	11·42	9·12	2·30
5	5 ,, 1 ,, ,,	12·25	9·09	3·16
6	10 ,, 3 ,, ,,	11·26	9·02	2·24
7	13 ,, 8 ,, ,,	14·12	9·82	4·30
8	3 ,, 2 ,, ,,	14·05	10·31	3·74
9	3 ,, 5 ,, ,,	13·53	10·47	3·06
10	11 ,, 4 ,, ,,	12·02	8·78	3·24
12	9 ,, 4 ,, ,,	13·46	9·70	3·76
14	4 ,, 4 ,, ,,	11·57	8·77	2·80
15	7 ,, 5 ,, ,,	12·86	9·95	2·91
16	4 ,, 2 ,, ,,	12·12	8·92	3·20
17	4 ,, 3 ,, ,,	12·47	9·07	3·40
18	7 ,, 3 ,, ,,	12·02	8·59	3·43
19	4 ,, 3 ,, ,,	13·38	9·41	3·97
20	9 ,, 4 ,, ,,	13·74	9·54	4·20
21	4 ,, 4 ,, ,,	13·54	9·94	3·60
22	10 ,, 3 ,, ,,	12·70	9·01	3·69
23	7 ,, 4 ,, ,,	13·97	9·77	4·20
24	3 ,, 4 ,, ,,	13·88	9·68	4·20
25	3 ,, 3 ,, ,,	12·62	9·23	3·39
26	9 ,, 3 ,, ,,	13·97	9·43	4·54
27	9 ,, 3 ,, ,,	12·22	9·39	2·83
28	4 ,, 3 ,, ,,	12·22	8·79	3·43
30	9 ,, 5 ,, ,,	13·16	9·56	3·60
31	3 ,, 3 ,, ,,	13·22	9·42	3·80
32	12 ,, 4 ,, ,,	11·41	8·52	2·89
33	3 ,, 4 ,, ,,	12·57	8·77	3·80
	Average quality of the 30 Cows	12·82	9·30	3·49

The samples were milked in presence of two witnesses and properly bottled and sealed with the stamp of the Association, and analysed by Dr. Drinkwater, 5, Teviot Place, Edinburgh.

APPENDIX No. IX.

Handed in by Sir CHARLES CAMERON. (Q. 2417.)

On the Composition of the Milk yielded Morning and Evening by Cows at Glasnevin Government Agricultural Institution. By Sir *Charles A. Cameron*, C.B., M.D.

With the co-operation of Professor Carroll, Superintendent of the Agricultural Department of the Commissioners of National Education, I have arranged some experiments to determine whether linseed or linseed cake is the more economical food for milch cows. The experiments have not been carried on for a sufficiently long period to warrant any conclusions being deduced from them, but the analyses of the milk of some cows experimented with have afforded results which are worth noting. At the present time a Bill to amend the Sale of Food and Drugs, and Margarine Acts is before the House of Commons. It contains a clause enabling a committee of experts to provide standards for milk and other articles. There is at present a standard minimal strength for whisky and the other stronger alcoholic liquors. If the Bill now before Parliament passes, there is no doubt but that the minimal amounts of non-fatty and fatty solids in milk will be considered by experts and a legal standard will be fixed for milk, as has already been done for spirits. Although there is no legal standard for milk, that fixed by the Inland Revenue Chemists, Somerset House, appears to be the one generally adopted, although many public analysts consider it too low. According to this standard milk should contain 8·5 per cent. of non-fatty solids, and 2·75 per cent. of fats. In several instances the milk of cows at the Glasnevin farm contained less than 2·75 per cent. of fat, but in no instance were the non-fatty solids deficient. Eight cows were selected and the following were their weights :—

No.	Cwts.	qrs.	lbs.
10	10	3	14
32	10	0	5
37	10	0	7
43	11	2	14
44	11	1	0
48	11	3	3
81	11	3	6
86	11	1	9

YIELD and PERCENTAGE COMPOSITION of the MILK of each of eight cows, taken during six days.

	MORNING.				EVENING.				MORNING.				EVENING.			
No. of Cow.	Solids.	Non-Fatty Solids.	Fats.	Lbs.	Solids.	Non-Fatty Solids.	Fats.	Lbs.	Solids.	Non-Fatty Solids.	Fats.	Lbs.	Solids.	Non-Fatty Solids.	Fats.	Lbs.
37	13	10·1	2·9	19	14·98	9·38	5·6	10	11·58	8·68	2·9	18	15·18	8·78	6·4	8
	11·78	9·58	2·2	15½	13·98	9·18	4·8	10	13·2	9·2	4·0	18	13·92	9·22	4·7	8
	12·9	9·4	3·5	15	13·18	8·78	4·4	12½	13·92	9·22	4·7	16	15·06	9·36	5·7	8
10	11·5	9	2·5	14	12·92	8·72	4·2	10	12·02	8·92	3·1	13½	13·24	9·26	4·5	7½
	12	9·1	2·9	14½	13·52	9·12	4·4	7	11·94	8·94	3·0	16½	12·92	8·92	4·0	8
	11·86	8·86	3·0	16	13·0	8·5	4·5	6½	11·8	9·0	2·8	18	13·02	8·82	4·2	8
32	14·6	10·1	4·5	18½	14·68	9·58	5·1	9	13·18	9·68	3·5	17¾	14·8	9·2	5·6	9
	13·1	9·6	3·5	18	14·82	9·42	5·4	8½	12·94	9·14	3·8	20	15·54	9·14	6·4	8
	13·3	9·4	3·9	18	14·26	9·46	4·8	9¾	13·28	9·28	4·0	20	16·16	9·36	6·8	8
43	12·52	9·32	3·2	17	13·96	9·46	4·5	9½	12·74	9·24	3·5	17½	13·68	8·78	4·9	10
	12·3	9·2	3·1	17	14·14	9·24	4·9	10	12·34	9·04	3·3	21½	14·38	9·28	5·1	10
	12·30	9·5	2·8	19	14·14	9·34	4·8	10	11·48	9·18	2·3	20½	14·42	9·42	5·0	10
44	11·6	9·1	2·5	20	14·12	8·92	5·2	8	11·88	9·08	2·8	19	13·64	8·64	4·7	11
	12·2	9.5	2·7	20	13·96	9·36	4·6	11	11·92	9·52	2·4	20	13·62	9·12	4·5	10½
	12·0	9·3	2·7	17	13·60	9·00	4·6	9½	11·88	9·18	2·7	19½	14·64	8·74	5·9	10½
48	12·18	9·58	2·6	16	12·92	8·62	4·3	7	11·88	8·98	2·9	18½	13·12	9·12	4·0	11
	11·78	9·28	2·5	17	13·72	9·12	4·6	10	11·80	9·2	2·6	19	13·10	9·00	4·1	9
	11·68	9·18	2·5	18	13·02	8·52	4·5	4	11·38	8·88	2·5	20	13·22	9·12	4·1	9
81	12·76	9·46	3·3	13	14·72	9·92	4·8	7	12·28	9·48	2·8	13	14·32	9·22	5·1	7
	12·98	9·78	3·2	16	13·78	9·78	4·0	7½	12·16	9·36	2·8	13½	13·78	9·18	4·6	8
	12·48	9·68	2·8	12	13·82	9·22	4·6	6	11·68	9·18	2·5	15	13 62	9·22	4·4	8
86	11·6	9·2	2·4	13½	13·46	8·56	4·9	10	11·68	9·18	2·5	14½	14·20	8·8	5·4	9
	11·2	8·9	2·3	14	13·98	9·18	4·8	7	14·20	8·8	5·4	17	13·38	8·58	4·8	10½
	11·2	9·2	2·2	15	13·22	8·82	4·4	8½	11·0	8·8	2·2	17½	13·32	8·52	4·8	10½

Mean composition of the milk of each of the eight cows taken during six days ended April 17th, 1899 :—

	MORNING.			EVENING.		
Cow No.	Total Solids.	Non-Fatty Solids	Fat.	Total Solids.	Non-Fatty Solids.	Fat.
10	11·8	8·9	3·9	13·1	8·8	4·3
32	13·2	9·3	3·0	15·0	9·3	5·7
37	12·3	9·3	2·9	14·3	9·0	5·3
43	12·2	9·2	3·0	14·0	9·2	4·8
44	11·9	9·3	2·6	13·8	8·9	4·9
48	11·7	9·1	2·6	13·0	8·7	4·3
81	12·3	9·4	3·9	13·9	9·4	4·5
86	11·3	9·0	2·3	13·5	8·7	4·8

Mean composition of the milk of the eight cows for six days :—

MORNING.			EVENING.		
Total Solids.	Non-Fatty Solids.	Fats.	Total Solids.	Non-Fatty Solids.	Fat.
12·1	9·2	2 9	13·88	9	4·88

The eight cows were then divided into batches and put on different diets. The following table shows the composition of their milk :—

Mean composition of the Milk of sets of three Cows put upon the following diet :—

Batch.	No. of Cows.	Daily Rations.	Morning.			Evening.		
			Total Solids.	Non-Fatty Solids.	Fat.	Total Solids.	Non-Fatty Solids.	Fat.
		First Week, April 18th to 24th, 1899.						
I.	10 32 37	9 st. Mangels - 4 lb. Linseed Cake 17 lbs. Hay - -	12·80	9·40	3·40	14·52	9·22	5·30
II.	43 44 48	9 st. Mangels - 5⅕ lb. Linseed Meal 17 lb. Hay - -	11·90	8·90	3·00	13·50	8·75	4·75
III.	– 81 86	9 st. Mangels - 5⅕ lb. Linseed - 17 lb. Hay - -	11·74	9·00	2·74	13·74	8·74	5·00
*IV.	– 47 51	9 st. Mangels - 4 lb. Linseed Cake 17 lb. Hay -	12·14	9·04	3·10	13·97	8·69	5·28
		Second Week from April 25th to May 1st, 1899.						
I.	10 32 37	9 st. Mangels - 5⅕ lb. Linseed - 17 lb. Hay - -	12·33	9·03	3·30	13·93	8·83	5·10
II.	43 44 48	9 st. Mangels - 4 lb. Linseed Cake 17 lb. Hay - -	11·48	8·88	2·60	13·14	8·74	4·40
III.	– 81 86	9 st. Mangels - 5⅕ lb. Linseed - 17 lb. Hay - -	11·54	8·81	2·73	13·30	8·55	4·75
*IV.	– 47 51	9 st. Mangels - 5⅕ lb. Linseed - 17 lb. Hay - -	11·60	8·93	2·87	13·42	8·57	4·35

* These cows are in addition to the eight above mentioned.

In the 48 specimens of morning's milk the non-fatty solids never were so low so 8·5 per cent., the minimal standard, whilst in 18 of the specimens the fats were below the minimal standard of 2·75 per cent.

In the 48 specimens of evening's milk the solids, not fats, never sank below the minimal standard, but in 18 instances they were less than 9 per cent.

It will be seen then that so far as these 96 specimens of milk are concerned, the standard of 8·5 per cent. of non-fatty solids holds good ; but that the standard for fats fails in the case of the morning's milk. The morning's milk was rich in non-fatty solids and poor in fats, whilst the evening's milk was rather poor in non-fatty solids and very rich in fats. In some instances the percentage of fat was more than twice as large in the evening's milk as in the morning's.

There was only 8 hours interval between the times of milkings ; if the interval were longer the difference between the morning and evening's milk might not be so great.

The diets upon which the cows were placed after the first week of the experiments seem to have been insufficient. Three (Nos. 10, 32 and 37) received daily each for one week 9 stones of mangels, 17 lbs. of hay, and 4lbs. of linseed cake. Their combined weight was on this diet reduced by 178 lbs. They gave less milk by 22½ lbs. The composition of the milk remained unchanged as regards the morning's, and the evening's was slightly richer.

A batch of three cows (Nos. 43, 44, and 48) fed daily on 9 stones of mangels, 17 lbs. of hay, and 5 1-5 lbs. linseed lost in one week 245 lbs. The yield of milk declined only by 6 lbs., and its composition practically remained unaltered.

Similar results were obtained in the case of other batches of cows not receiving the usual food. It is the flesh of the animals that first declines when the aliment is insufficient. I shall not, however, dwell further on this point as it will be made the subject of a thorough investigation at Glasnevin

APPENDIX No. X.

Handed in by Dr. A. K. Chalmers. (Q. 3383.)

Composition of Farmers' Milk as delivered in Glasgow, based on 25 Samples, each representing the mixed yield of individual herds, taken in transit from producer to retailer.

Lanarkshire.				Ayrshire.				Dumfriesshire.			
Total Solids.	Fat.	Solids Not Fat.	Remarks.	Total Solids.	Fat.	Solids Not Fat.	Remarks.	Total Solids.	Fat.	Solids Not Fat.	Remarks.
11·98	3·16	8·82	Genuine.	11·70	2·74	8·96	Genuine.	11·05	2·75	8·30	Doubtful.
11·70	3·36	8·34	Doubtful.	11·66	2·83	8·83	,,	11·43	2·80	8·63	Genuine.
12·11	3·49	8·62	Genuine.	11·84	3·32	8·52	,,	13·10	4·18	8·92	,,
12·45	3·56	8·89	,,	12·45	3·65	8·80	,,	13·55	4·75	8·80	,,
13·00	3·64	9·36	,,	12·80	3·67	9·13	,,				
12·51	3·71	8·80	,,	12·46	3·70	8·76	,,				
12·69	3·95	8·74	,,	12·50	3·68	8·82	,,				
12·90	4·00	8·90	,,	12·65	3·76	8·89	,,				
13·87	5·50	8·37	,,	12·90	3·81	9·09	,,				
				12·82	4·12	8·70	,,				
				13·00	4·35	8·65	,,				
				13·67	4·67	9·00	,,				
Average of 9 Samples.				Average of 12 Samples.				Average of 4 Samples.			
12·58	3·82	8·76		12·53	3·69	8·84		12·28	3·62	8·66	

APPENDIX No. XI.

Handed in by Dr. A. K. Chalmers. (Q. 3395.)

A.—Details of the Analysis of 280 samples of Retailers' Sweet Milk.

—	Fat.	Non-fatty Solids.
1897: February	2·97	8·43
	3·38	9·04
	2·72	8·60
	2·75	8·79
	3·06	8·72
	3·01	8·45
	2·72	9·40
	2·92	9·04
March	3·07	8·40
	3·40	8·96
	2·70	8·44
	3·18	8·83
	2·70	8·81
	4·46	8·82
	2·88	9·24
	2·70	9·03
	2·82	8·74
	3·66	8·98
	2·96	8·80
	2·92	8·90
	2·70	8·66
	3·08	8·88
April	3·90	8·69
August	2·78	8·87
	2·70	8·57
	2·75	8·48
	2·80	8·50
	3·07	9·13
	2·87	8·51
December	3·06	8·44
	2·96	8·81
	2·78	8·46
	3·11	8·93
	3·25	9·15
	3·63	8·77
	3·40	8·82
	2·74	8·57
	3·05	8·87
	2·96	8·89
	3·50	8·70
	3·54	8·71
	2·85	8·35
	3·40	8·70
	3·58	9·02
	2·88	9·03
1898: February	6·53	8·52
	2·75	9·15
	3·15	8·45
	3·69	8·76
	2·70	8·75
	2·90	8·60
	2·70	9·13
	3·34	9·03
	3·50	8·90
	2·90	9·05
	2·74	8·79
	3·00	9·28
	3·10	9·33
	2·72	8·75
	2·65	9·08
April	3·30	9·20
	2·06	9·10
	3·55	8·80
	3·16	8·57
	2·30	8·47
	2·57	7·89
	3·12	8·51
	3·31	9·02
	3·06	8·44
1898: April	2·35	8·63
	3·12	8·50
	4·10	8·67
	2·57	8·80
	4·10	8·90
	3·60	9·01
	2·70	8·57
	3·30	8·30
	3·22	9·35
	5·77	8·70
	2·75	8·70
	3·16	8·47
	3·10	8·50
	2·68	8·61
	3·30	8·55
	3·34	8·86
	2·81	8·61
	3·35	8·52
	3·11	8·80
	3·40	8·50
	2·94	9·21
	3·02	8·91
	2·75	8·73
	2·80	8·50
	3·06	8·76
	3·30	8·80
	3·74	8·91
	3·04	8·64
	4·50	8·50
	4·80	9·00
	3·24	8·73
	3·42	8·72
July	3·88	8·52
	3·30	8·58
	2·70	8·60
	2·56	8·94
September	3·20	9·00
	3·00	9·06
	3·07	8·43
	3·73	9·25
	4·50	8·41
	3·20	8·88
	3·48	8·80
	5·58	8·77
	3·41	8·84
	3·35	8·35
	3·90	8·79
	3·28	9·00
	3·60	8·78
	2·90	8·90
	2·77	9·03
	4·66	9·12
	3·01	9·00
	3·70	8·87
	2·42	8·80
	3·45	8·72
	3·20	9·05
	4·46	8·75
	5·44	8·64
	3·80	8·95
	3·38	8·94
	2-68	8·73
	3·38	9·26
	4·80	9·03
	3·10	9·55
	3·81	8·89
	5·30	8·92
October	3·04	8·99
	2·78	8·38
	3·13	8·89
	2·76	9·10
	4·31	8·75
	2·88	9·09
	3·83	9·14
1898: October	3·81	8·95
	2·75	8·50
	2·90	8·86
	7·13	8·86
	2·80	8·86
	3·32	8·85
	2·94	8·79
	2·72	8·73
	2·73	9·11
	3·46	9·12
	2·70	9·02
	4·00	8·71
	4·30	8·90
	3·51	8·70
November	3·80	8·86
	3·19	8·85
	3·30	8·88
	2·70	8·53
	3·12	9·05
	3·50	8·01
	3·03	8·92
	3·30	8·72
	3·83	8·53
	3·45	9·21
	3·69	8·56
	3·10	8·90
	4·65	8·75
	2·75	8·72
	2·95	9·13
	3·00	8·75
	2·78	8·86
	2·70	8·86
December	3·00	8·55
	3·31	9·09
	2·96	8·44
	2·93	8·87
	2·76	8·99
	3·53	9·11
	3·50	8·55
	3·53	8·97
	3·61	8·67
	3·58	9·25
	5·05	8·76
	3·33	8·97
	2·95	8·78
	2·71	8·65
	2·78	8·61
	2·67	8·83
	2·80	8·80
	3·40	8·68
	2·90	8·56
	3·30	8·90
1899: February	2·86	8·54
	5·45	8·45
	3·12	9·06
	3·10	8·57
	2·85	9·31
	2·86	8·46
	3·15	9·29
	3·38	8·62
	3·62	8·66
	4·43	8·83
	2·74	8·90
	3·05	8·48
	2·95	9·23
	3·30	8·86
	5·85	8·68
	2·67	*9·13
	3·15	9·08
	2·62	†8·91
	2·86	9·20
	3·01	8·67

* 2 per cent. deficient in fat. Too narrow for prosecution.

† 4 per cent. deficient in fat. Too narrow for prosecution.

A.—Retailers' Sweet Milk—*continued.*

—	Fat.	Non-fatty Solids.	—	Fat.	Non-fatty Solids.	—	Fat.	Non-fatty Solids.
1899:			1899:			1899:		
April - -	3·55	8·49	June - -	2·70	*8·88	October - -	3·13	9·30
	4·83	8·65		3·16	8·98		2·85	8·62
	3·70	8·57		2·70	*9·02		3·85	9·13
	3·30	8·53		2·75	8·86		3·04	8·95
	2·82	8·88		3·80	8·66		2·66	9.36
	3·03	8·67					3·00	8·72
	2·88	8·50					3·11	9·34
	2·85	8·67	September -	2·94	8·96		3·01	8·94
	3·23	8·83		3·53	8·97		3·38	9·12
	3·14	9·19		2·70	8·35		3·04	9·28
	3·38	8·52		3·02	†8·10		4·57	8·98
	3·30	8·87		2·82	9·84		2·70	‡8·78
	4·36	8·91		4·78	8·90		3·32	9·01
	3·53	9·05					3·32	8·67
	2·70	*8·70					2·73	8·51
	3·58	8·49	October - -	3·15	8·42		3·81	8·63
	2·70	8·90		3·27	8·67		2·85	8·62
	2·83	8·62		3·80	8·57		2·98	9·11
	3·50	8·76		3·60	8·51		3·28	9·30
	4·25	8·91		2·82	9·23		2·75	8·86
	2·75	8·37		2·98	9·20		2·87	§9·24
	4·05	*8·78		3·38	‡8·63		3·47	‖9·37
	4·04	8·73		2·78	§9·18		2·47	8·94

* Doubtful. † Four per cent. added water. Too narrow for prosecution.

‡ 51 grm. boric acid per gallon. § 8 grm. boric acid per gallon. ‖ 40 grm. boric acid per gallon.

B.—Average Monthly Composition of Retailers' Sweet Milk. (A Summary of Table A.)

Month.	Year.	Number of Observations.	Total Solids.	Fat.	Solids not Fat.
January - - -	—	—	—	—	—
February - - -	1897	8	11·75	2·94	8·81
	1898	15	12·19	3·22	8·97
	1899	20	12·19	3·35	8·84
	3 years	43	12·09	3·23	8·86
March - - - -	1897	14	11·91	3·09	8·82
April - - - -	1897	1	12·59	3·90	8·69
	1898	41	11·95	3·24	8·71
	1899	23	12·12	3·40	8·72
	3 years	65	12·01	3·30	8·71
May - - - -	—	—	—	—	—
June - - - -	1899	5	11·90	3·02	8·88
July - - - -	1898	4	11·77	3·11	8·66
August - - - -	1897	6	11·50	2·83	8·68
September - - -	1898	31	12·55	3·66	8·89
	1899	6	12·15	3·30	8·85
	2 years	37	12·48	3·60	8·88
October - - -	1898	21	12·29	3·42	8·87
	1899	31	12·10	3·16	8·94
	2 years	52	12·17	3·26	8·91
November - - -	1898	18	12·15	3·32	8·83
December - - -	1897	16	11·93	3·17	8·76
	1898	20	12·03	3·23	8·80
	2 years	36	11·98	3·20	8·78
SEASONAL VARIATIONS.					
Winter months, November, December - - - -			12·07	3·25	8·82
Summer months, June to August - - - -			11·73	2·99	8·74
„ „ September, October - - - -			12·32	3·43	8·89
„ „ February, March, April - - -			12·01	3·21	8·80

APPENDIX No. XII.

Handed in by Dr. A. K. Chalmers. (Q. 3407.)

Forms of Adulteration. Farmers and Retailers Compared. Analyses of Samples on which Prosecution was Based.

FARMERS.

Month.	Fat.	Solids Not Fat.	Remarks.
1897:			
January	2·21	6·39	24% added water.
1898:			
March	2·70	6·84	19% ditto.
April	2·86	7·20	15% ditto.
	2·90	7·46	12% ditto.
	3·00	7·46	12% ditto.
	2·80	6·80	20% ditto.
June	2·11	6·12	28% ditto.
	2·50	7·20	15% ditto.
	2·96	7·40	13% ditto.
August	3·10	7·38	13% ditto.
	3·28	8·15	4% ditto.
	3·25	8·30	5% ditto.
	3·49	7·42	12% ditto.
December	3·45	8·24	3% ditto.
1899:			
March	3·30	8·11	4% ditto.
	2·13	6·33	25% ditto.
	2·46	6·88	19% ditto.
	3·55	7·72	9% ditto.
	3·57	7·52	11% ditto.
	3·52	7·40	13% ditto.
May	3·12	6·80	20% ditto.

RETAILERS.

Month.	Fat.	Solids not Fat.	Remarks.
1897:			
February	2·20	9·10	20% deficient in fat.
	2·45	8·86	11% ditto.
	2·20	8·54	20% ditto.
	2·10	9·08	23% ditto.
March	1·77	8·95	35% ditto.
	2·40	8·85	12% ditto.
	2·00	9·08	27% ditto.
	2·50	8·66	9% ditto.
	1·65	8·61	40% ditto.
	1·73	8·40	37% ditto.
	2·45	8·40	11% ditto.
	2·53	8·67	8% ditto.
	2·41	8·96	12% ditto.
	2·40	9·16	12% ditto.
1898:			
February	2·20	8·80	20% ditto.
	1·94	8·35	29% ditto.
April	2·19	9·06	20% ditto.
	2·09	9·24	24% ditto.
	2·06	9·03	25% ditto.
	1·42	8·55	48% ditto.
	2·33	8·47	15% ditto.
	2·47	8·40	10% ditto.
	2·20	8·84	20% ditto.
August	2·23	9·05	19% ditto.
September	2·67	8·05	5% added water.
October	2·13	9·05	22% deficient in fat.
	2·34	7·55	11% added water.
November	2·77	7·97	6% ditto.
	1·38	9·53	49% deficient in fat.
	2·34	9·40	14% ditto.
	2·00	9·18	27% ditto.
	2·00	7·95	27% ditto and 6% added water.
	2·30	8·80	16% deficient in fat.
	2·94	8·06	5% added water.
December	3·00	7·98	6% ditto.
	2·34	8·54	15% deficient in fat.
	2·10	8·50	23% ditto.
	2·21	8·59	19% ditto.
1899:			
February	2·58	8·56	6% ditto.
	2·50	9·04	5% ditto.
	2·03	6·13	27% added water.
	2·25	9·24	18% deficient in fat.
	2·35	8·55	14% ditto.
April	3·15	7·95	6% added water
June	1·98	8·98	28% deficient in fat.
October	2·22	9·31	19% ditto.
	1·77	8·96	35% ditto.
	2·40	8·62	12% ditto.
	2·13	9·48	22% ditto.
	2·28	9·60	17% ditto.
	2·36	8·82	14% ditto.
	2·32	8·54	15% ditto.
	1·[illegible]8	9·12	46% ditto.

APPENDIX No. XIII.

Handed in by Mr. W. H. Ralston. (Q. 5661.)

Average Monthly Analysis of all the Milk received at the Dunragit Creamery from March 1892 to February 1900.

——	1892.	1893.	1894.	1895.	1896.	1897.	1898.	1899.	1900.	Average.
January - - -	–	3·43	3·59	3·69	3·65	3·50	3·50	3·59	3·47	3·55
February - -	–	3·31	3·47	3·64	3·45	3·41	3·43	3·48	3·49	3·46
March - - -	3·21	3·22	3·37	3·49	3·42	3·31	3·33	3·36	–	3·33
April - - -	3·22	3·26	3·43	3·46	3·39	3·42	3·35	3·37	–	3·36
May - - -	3·15	3·30	3·39	3·39	3·31	3·35	3·31	3·30	–	3·31
June - - -	3·19	3·32	3·51	3·38	3·40	3·36	3·33	3·29	–	3·34
July - - -	3·42	3·44	3·50	3·54	3·54	3·42	3·38	3·40	–	3·45
August - - -	3·58	3·47	3·60	3·68	3·65	3·56	3·52	3·51	–	3·57
September - -	3·86	3·59	3·85	3·82	3·89	3·80	3·78	3·85	–	3·80
October - - -	–	3·80	3·99	3·96	3·91	3·82	3·88	4·08	-	3·92
November - -	3·60	3·72	4·01	3·94	3·91	3·79	3·82	3·97	–	3·84
December - -	3·69	3·75	3·76	3·83	3·76	3·69	3·66	3·65	–	3·72
Average -	3·44	3·46	3·62	3·65	3·60	3·53	3·52	3·57	–	3·55

APPENDIX No. XIV.

Handed in by Mr. F. J. Lloyd. (Q. 5938.)

Average Composition of Genuine Milk* from Members of Metropolitan Dairymen's Society.

——	1897.				1898.				1899.			
	No.	Fat.	Casein, &c.	Total Solids.	No.	Fat.	Casein, &c.	Total Solids.	No.	Fat.	Casein, &c.	Total Solids.
January -	10	3·64	8·98	12·62	21	3·69	8·99	12·68	15	3·72	9·07	12·79
February -	23	3·53	9·00	12·53	33	3·65	8·95	12·60	23	3·78	9·04	12·82
March - -	21	3·44	9·01	12·45	17	3·50	8·88	12·38	27	3·36	9·01	12·37
April - -	52	3·58	8·99	12·57	26	3·59	8·94	12·53	30	3·55	8·97	12·52
May - -	23	3·30	9·03	12·33	34	3·42	8·99	12·41	13	3·40	8·95	12·35
June - -	20	3·35	8·95	12·30	53	3·40	8·99	12·39	17	3·43	9·03	12·46
July - -	27	3·33	8·90	12·23	19	3·35	8·93	12·28	15	3·42	8·88	12·30
August - -	20	3·48	8·80	12·28	13	3·52	8·81	12·33	39	3·77	8·79	12·56
September -	21	3·49	8·82	12·31	62	3·73	8·82	12·55	22	3·94	8·99	12·93
October -	31	3·75	9·01	12·76	18	3·63	9·04	12·67	53	3·64	8·98	12·62
November -	39	3·83	8·93	12·76	15	3·52	9·01	12·53	15	3·85	8·98	12·83
December -	22	3·54	8·98	12·52	14	3·33	9·07	12·40	13	3·61	9·06	12·67
Average -	309	3·52	8·95	12·47	325	3·53	8·95	12·48	282	3·62	8·98	12·60

* Average composition of the samples not reported as adulterated, *i.e.*, having not less than 8·55 % solids other than fat, and not less than 2·70 % fat = 11·25 total solids.

APPENDIX No. XV.

Handed in by Mr. F. J. Lloyd. (Q. 5954.)

A.—Milk from Dairy Herds in Somerset. Average about 50 Cows.

	1892.		1893.		1894.		1895.		1896.		1897.	
	Fat.	Solids.	Fat.	Solids.	Fat.	Solids.	Fat.	Solids.	Fat.	Solids.	Fat.	Solids.
April - -	3·06	11·75	3·09	11·89	3·29	12·31	3·70	12·65	3·83	12·75	3·87	12·74
May - -	3·12	12·04	3·05	12·01	3·35	12·51	3·39	12·58	3·70	12·78	3·65	12·65
June - -	3·17	12·20	3·08	12·03	3·40	12·52	3·51	12·56	3·57	12·59	3·50	12·37
July - -	3·21	12·20	3·20	12·14	3·47	12·52	3·60	12·68	3·66	12·61	3·61	12·46
August - -	3·38	12·28	3·19	12·14	3·70	12·78	3·80	12·82	3·82	12·73	3·66	12·54
September -	3·57	12·56	3·53	12·53	3·93	13·05	3·94	13·03	4·31	13·19	3·86	12·89
October -	4·00	13·13	4·30	13·49	4·39	13·46	4·55	13·70	4·41	13·38	4·18	13·22
Average -	3·36	12·31	3·35	12·32	3·66	12·73	3·78	12·86	3·90	12·86	3·76	12·69
Corrected for volume yielded each month	3·29	12·24	Average for the seven years - - -						Fat - 3·65 Solids - 12·64			

B.—Milk of Various Breeds.

Breed.	Number.	Fat.	Casein, &c.	Total Solids.
Shorthorns - - - - -	132	3·91	9·02	12·93
Jerseys - - - - -	158	5·31	9·33	14·64
Guernseys - - - - -	49	4·77	9·12	13·89
Ayrshires - - - - -	24	4·13	9·15	13·28
Kerries and Dexters - - -	48	4·06	8·93	12·99
Red Polls - - - - -	38	3·63	9·00	12·63
Crosses, &c.- - - - -	47	3·83	9·02	12·85

C.—Milk of Abnormal Cows.

——	Fat.	Casein, &c.	Total Solids.
Dr. Augustus Voelcker, 1863 - -	1·99	8·06	10·05
Chemical Society, Lloyd, 1890 - -	2·17	7·87	10·04
Ditto - - ditto - - - -	2·70	7·50	10·20
Bath and West School, 1898 - -	2·76	8·10	10·86
Ditto - - ditto - - - -	2·72	7·72	10·44
Ditto - - ditto - - - -	1·97	6·69	8·66
Ditto - - ditto - - - -	2·26	7·28	9·54
Private Herd, 1899 - - - -	2·93	7·81	10·74
Ditto - - morning - - -	2·36	8·28	10·64
Ditto - - evening - - -	4·39	7·81	12·20

D.—Shorthorns, Dairy Show.

Morning.		Evening.		Morning.		Evening.	
Fat.	Casein, &c.	Fat.	Casein, &c.	Fat.	Casein, &c.	Fat.	Casein, &c.
			1897.				
4·04	9·44	4·75	8·89	2·90	8·32	3·07	8·37
5·52	8·52	4·80	8·70	3·49	8·83	3·73	8·51
3·50	9·14	4·08	9·08	5·08	8·88	5·02	8·90
3·60	9·16	4·36	9·18	3·72	8·76	4·20	8·88
3·10	9·14	3·62	9·04				
3·39	8·37	4·37	7·99				
5·33	8·73	5·57	8·71	3·97	8·84	4·32	8·75
			1898.				
2·47	8·21	3·65	8·25	3·62	9·38	4·83	9·21
1·89	9·17	2·95	8·55	3·15	9·17	4·36	8·84
3·38	8·36	3·56	8·38	3·93	9·07	4·77	8·97
2·57	8·93	3·01	8·89	3·01	9·59	3·95	9·45
3·00	8·65	4·48	8·68	3·39	8·89	4·12	8·84
3·07	9·43	5·58	8·78	4·65	9·15	4·84	8·86
3·51	8·99	4·11	8·79	3·67	9·09	4·78	8·92
2·43	8·77	3·80	8·72	3·36	8·96	5·27	8·77
1·88	8·92	3·26	8·74	3·29	9·47	4·42	9·30
5·41	8·49	5·65	8·35	4·03	8·29	4·65	8·27
4·55	9·73	4·37	9·69	5·76	8·64	5·18	8·42
5·09	9·23	4·43	9·31	3·50	9·34	4·05	9·35
3·88	8·64	3·79	8·65				
2·95	9·25	3·28	9·42				
2·12	8·18	3·61	8·11	3·46	8·92	4·25	8·83
			1899.				
3·12	8·64	3·49	8·59	2·21	9·21	3·19	9·15
3·79	8·87	4·85	9·03	5·05	9·45	4·36	9·64
2·67	9·45	3·61	9·33	3·13	8·89	3·22	9·06
2·80	8·94	3·55	8·97	4·30	8·80	4·99	9·01
3·21	9·55	6·32	9·20	3·55	8·93	4·62	8·98
3·39	9·15	3·69	9·05	3·43	8·77	3·80	8·70
2·74	8·76	2·68	8·78	3·15	8·57	3·45	8·75
3·92	9·20	3·62	9·20	3·97	8·71	3·47	8·83
2·41	9·05	2·88	8·94	2·62	9·18	4·65	8·85
3·05	9·55	3·76	9·64	3·44	9·16	3·32	9·08
3·10	9·04	3·18	9·22	3·31	9·25	3·94	9·26
3·14	9·10	4·22	9·08				
2·90	8·74	3·99	8·81	3·27	9·04	3·87	9·05

3·97	8·84	4·32	8·75
3·46	8·92	4·25	8·83
3·27	9·04	3·87	9·05
3·57	8·93	4·15	8·88

APPENDIX No. XVI.

Handed in by Mr. F. J. LLOYD. (Q. 5944.)

ANALYSES for METROPOLITAN DAIRYMEN'S SOCIETY.

—	1897.								1898.								1899.							
	Number Analysed.	Adulterated.	Genuine.	Solids over				Under	Number Analysed.	Adulterated.	Genuine.	Solids over				Under	Number Analysed.	Adulterated.	Genuine.	Solids over				Under
				12·25	12·00	11·75	11·50	11·50				12·25	12·00	11·75	11·50	11·50				12·25	12·00	11·75	11·50	11·50
January -	16	6	10	7	3	0	0	0	24	4	20	16	3	1	0	0	16	1	15	13	2	0	0	0
February -	27	4	23	15	5	3	0	0	37	4	33	28	3	1	1	0	24	1	23	20	3	0	0	0
March - -	25	4	21	12	4	2	3	0	20	3	17	11	0	4	1	1	29	2	27	18	5	3	1	0
April - -	70	18	52	35	12	2	2	1	29	3	26	18	4	3	1	0	32	2	30	19	10	0	0	1
May - -	29	6	23	14	6	3	0	0	39	5	34	21	5	4	4	0	14	1	13	9	3	1	0	0
June - -	30	10	20	10	8	1	1	0	60	7	53	32	14	2	5	0	17	0	17	11	5	1	0	0
July - -	35	8	27	12	12	3	0	0	25	6	19	11	3	1	4	0	21	6	15	8	4	3	0	0
August - -	31	11	20	12	4	1	1	2	32	19*	13	6	5	1	1	0	47	8‡	39	34	4	1	0	0
September -	31	10	21	11	4	4	2	0	101	39†	62	42	10	7	3	0	31	9	22	20	2	0	0	0
October -	33	2	31	27	3	1	0	0	21	3	18	16	2	0	0	0	54	1	53	44	5	3	1	0
November -	59	20	39	35	0	2	2	0	15	0	15	11	2	2	0	0	15	0	15	15	0	0	0	0
December -	21	2	22	20	2	0	0	0	14	0	14	13	0	0	0	1	13	0	13	12	1	0	0	0
TOTAL -	410	101	309	210	63	22	11	3	417	93	324	225	51	26	20	2	313	31	282	223	44	12	2	1

Summary, 1,140 Analyses.
224 Adulterated.
916 Genuine.
Of Genuine samples :
Solids over 12·25=658 } =90%
12·00 158 }
11·75 60
11·50 34
„ under 11·50 6
916

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* These 19 samples are of special interest as they indicate the great difficulty of fixing a standard. Their average composition was : Fat 3·93 ; Casein, &c., 8·27. Solids 12·20. Thirteen had over 12 per cent. of Solids.

† These are mainly similar to above ; 28 had over 12 per cent. Solids, and 32 over 3·5 per cent. Fat. Five were undoubtedly adulterated samples. The remaining 34 had Fat 3·91, Casein. &c., 8·41 Solids 12·32.

‡ Seven of these had over 12 per cent. Solids and seven over 3·5 per cent. Fat.

APPENDIX No. XVII.

Handed in by Mr. F. J. Lloyd. (Q. 6031.)

Effect of various Standards on Report of Milks for Metropolitan Dairymen's Society.

	1897.								1898.								1899.							
	Number Analysed.	Under 2·70 Fat.	Under 3·0 Fat.	Under 3·25 Fat.	Under 8·55 Casein, &c.	Under 11·75 Solids.	Under 12·0 Solids.	Under 3 Fat and 12 Solids.	Number Analysed.	Under 2·70 Fat.	Under 3·0 Fat.	Under 3·25 Fat.	Under 8·55 Casein.	Under 11·75 Solids.	Under 12·0 Solids.	Under 3 Fat and 12 Solids.	Number Analysed.	Under 2·70 Fat.	Under 3·0 Fat.	Under 3·25 Fat.	Under 8·55 Casein.	Under 11·75 Solids.	Under 12·0 Solids.	Under 3·0 Fat and 12 Solids.
January -	16	1	2	3	5	4	5	5	24	2	2	7	4	4	5	5	16	0	0	2	1	1	1	1
February -	27	3	6	7	3	4	7	7	37	2	2	6	3	3	5	5	24	0	1	4	2	1	1	1
March - -	25	3	8	12	3	5	9	10	20	0	2	5	3	3	8	8	29	1	4	9	1	2	5	5
April - -	70	2	6	15	12	10	17	17	29	0	1	5	3	2	5	5	32	1	2	6	2	2	2	2
May - -	29	1	5	14	5	3	8	8	39	5	12	16	1	9	13	13	14	1	2	3	0	1	2	2
June - -	30	1	7	14	9	7	10	12	60	4	16	24	5	11	14	18	17	0	3	8	0	0	1	3
July - -	35	2	7	14	8	4	9	11	25	4	5	11	5	8	11	11	21	1	1	5	6	3	7	7
August - -	31	4	6	11	11	13	13	13	32	0	0	4	20	4	8	8	47	0	0	0	9	2	2	2
September -	31	7	9	15	8	11	15	15	101	3	6	12	41	10	21	21	31	1	2	7	9	5	8	8
October -	33	0	1	2	2	0	1	1	21	0	3	4	3	2	2	2	54	1	1	9	1	2	5	5
November -	59	6	10	14	16	15	18	18	15	0	1	4	0	0	2	2	15	0	0	0	0	0	0	0
December -	24	2	2	5	2	2	2	2	14	0	1	4	0	1	1	1	13	0	1	2	0	0	0	1
Total -	410	32	69	126	84	78	114	119	417	20	51	102	88	57	95	99	313	6	17	55	31	19	34	37

APPENDIX No. XVIII.

Handed in by Mr. F. J. Lloyd. (Q. 6075.)

Morning Milk supplied to Messrs. Tunks and Tisdall, Ltd., Kensington.

Average for	Herd I.		Herd II.		Herd III.		Herd IV.		Herd V.		Herd VI.		Herd VII.	
	Fat.	Casein, &c.	Fat.	Casein, &c.	Fat.	Casein, &c.	Fat.	Casein, &c.	Fat.	Casein, &c.	Fat.	Casein, &c.	Fat.	Casein, &c.
1887 - -	3·59	9·32	3·41	9·28	3·46	9·42	3·50	9·23	—	—	—	—	—	—
1888 - -	3·60	9·50	3·64	9·08	3·60	9·26	3·68	9·15	—	—	—	—	—	—
1889 - -	3·55	9·18	3·65	9·00	3·39	9·14	3·45	9·05	—	—	—	—	—	—
1890 - -	3·58	9·26	3·56	9·12	3·48	9·27	3·54	9·14	—	—	—	—	—	—
1891 - -	3·43	9·20	3·56	9·04	3·36	9·10	3·33	9·17	—	—	—	—	—	—
1892 - -	3·36	9·24	3·48	9·18	3·40	9·10	3·44	9·08	3·60	9·19	—	—	3·23	9·11
1893 - -	3·28	9·10	3·31	9·15	3·44	9·06	3·53	8·97	3·50	9·10	3·54	8·93	3·48	9·09
1894 - -	3·25	8·95	3·58	9·17	3·24	9·00	—	—	3·35	9·15	3·37	8·89	3·41	9·00
1895 - -	3·54	9·24	3·58	9·20	3·26	9·04	—	—	3·56	9·24	3·39	9·08	—	—
1896 - -	3·51	9·37	3·52	9·27	3·30	9·06	—	—	3·44	9·29	3·69	9·18	—	—
1897 - -	3·53	9·22	3·47	9·06	3·25	8·90	—	—	3·43	9·30	3·50	9·12	—	—
1898 - -	3·41	9·13	3·43	9·03	—	—	—	—	3·50	9·02	3·58	9·18	—	—
1899 - -	3·58	9·20	3·78	8·96	—	—	—	—	3·47	8·91	3·50	9·10	—	—

Of about 600 analyses which these figures represent, the fat fell below 3·25 per cent. in 87 cases, or nearly 15 per cent.

APPENDIX No. XIX.

Handed in by Mr. F. E. Walker. (Q. 7600.)

A.—Summary of Milk Tests, Escrick Park Dairy, 1897–8.

1897–98. Month.	Number of Tests.	Quantity in Gallons showing Percentage of Butter Fat.									Total Gallons.
		2·8	3·0	3·2	3·4	3·6	3·8	4·0	4·2	4·4	
April - - -	148	–	101	6,212	14,077	1,843	–	–	–	–	22,233
May - - -	150	–	–	4,452	19,553	2,557	148	29	–	–	26,739
June - - -	153	1,261	3,798	10,319	8,486	1,846	521	186	5	72	26,494
July - - -	150	389	2,387	6,627	7,115	5,813	693	70	127	64	23,221
August - - -	150	–		1,142	3,463	7,954	4,974	629	39	–	18,265
September - -	150	–	428	2,130	7,574	4,021	492	70	–	–	14,715
October - - -	150	–	465	2,484	7,645	3,531	376	66	–	–	14,567
November - -	147	–	–	2,106	6,744	6,319	–	72	–	–	15,241
December - -	144	–	104	518	5,092	5,972	2,806	337	28	–	14,857
January - -	144	–	65	617	5,611	6,661	1,041	406	50	–	14,451
February - -	120	–	2,306	3,311	5,046	2,066	1,309	69	128	–	14,235
March - - -	120	517	1,695	4,972	4,755	2,086	1,091	236	41	–	15,393
Totals - -		2,167	11,349	44,890	95,161	50,669	13,451	2,170	418	136	220,411

B.—Summary of Milk Tests, Escrick Park Dairy, 1898–9.

1898–99. Month.	Number of Tests.	Quantity in Gallons, showing Percentage of Butter Fat.									Total Gallons.
		2·8	3·0	3·2	3·4	3·6	3·8	4·0	4·2	4·4	
April - - -	120	–	1,585	5,845	6,883	1,911	136	–	–	–	16,360
May - - -	123	811	1,434	3,618	7,244	4,541	1,157	95	–	–	18,900
June - - -	123	80	4,998	8,537	3,871	1,710	946	133	–	–	20,275
July - - -	120	50	2,497	4,208	5,379	3,734	217	–	–	–	16,085
August - - -	123	–	814	1,691	7,511	3,679	535	50	–	–	14,280
September - -	117	–	828	954	4,467	3,433	1,226	286	–	–	11,194
October - - -	117	–	117	1,690	3,221	3,147	2,173	720	–	–	11,068
November - -	117	–	246	1,249	4,334	4,235	1,638	874	–	–	12,576
December - -	117	–	706	1,463	7,305	4,595	1,250	142	–	–	15,461
January - - -	114	–	3,102	2,852	5,530	3,442	326	192	37	–	15,481
February - -	111	–	415	4,310	4,969	2,532	427	30	–	–	12,683
March - - -	111	–	533	2,192	6,011	3,640	450	275	–	–	13,101
Totals - - -	1,413	941	17,275	38,609	66,725	40,599	10,481	2,797	37	–	177,464

C.—SUMMARY of MILK TESTS, Escrick Park Dairy, 1899–1900.

1899–1900. Month.	Number of Tests.	Quantity in Gallons shewing Percentage of Butter Fat.									Total Gallons.
		2·8	3·0	3·2	3·4	3·6	3·8	4·0	4·2	4·4	
April - - -	108	–	12	54	6,037	4,390	2,107	281	–	–	12,881
May - - -	111	–	–	709	8,931	4,371	476	–	–	–	14,487
June - - -	111	–	393	5,213	5,623	2,097	183	–	–	–	13,509
July - - -	111	–	1,832	4.206	5,404	850	–	–	–	–	12.112
August - - -	90	–	840	3,648	3,839	987	–	–	–	–	9,314
September - -	90	–	819	3.751	3,097	29	–	–	–	–	7,696
October - - -	87	–	1,799	2,770	2,569	450	–	–	–	–	7,588
November - -	78	–	378	3,978	4,846	–	–	–	–	–	9,202
December - -	76	–	1,373	7,716	1,232	270	–	0	–	–	10.591
January - -	48	–	1,257	5,690	1,535	503	66	39	–	–	9,090
February - -	48	–	–	2,146	5,401	861	171	120	–	69	8.768
March - - -	51	–	–	3,316	5,608	470	–	–	–	80	9,474
Totals - -	1,009	–	8,703	43,017	54,122	15,278	3,003	440	–	149	124,712

APPENDIX No. XX.

Handed in by Mr. F. E. WALKER. (Q. 7600.)

QUANTITY in lbs. and per cent. of BUTTER FAT in Bulk Samples sent to the Escrick Park Dairy, April, 1900.

	17th.				18th.				19th.				20th.			
	Morning.		Evening.		Morning.		Evening.		Morning.		Evening.		Morning.		Evening.	
	Lbs.	Per cent.	Lbs.	Per cent.	Lbs.	Per cent.	Lbs.	Per cent.	Lbs.	Per cent.	Lbs.	Per cent.	Lbs.	Per cent.	Lbs.	Per cent.
1	942	3·0	556	3·4	938	3·4	583	3·6	936	3·4	578	3·8	954	3·4	564	3·8
2	100		56	3·0	98	3·4	50	3·4	96	3·2	46	3·4	94	3·0	98	3·4
3	150	3·4	98	3·6	148	3·4	98	3·4	146	3·4	90	3·8	138	3·0	86	3·6
4	198	3·6	174	4·0	200	3·6	166	3·8	200	3·6	166	3·8	200	3·8	174	3·8
5	78	3·4	60	4·0	80	3·6	60	3·6	76	3·4	62	3·4	82	3·4	60	3·4
6	42	4·0	36	4·0	52	4·2	22	4·2	52	3·6	36	4·0	48	4 0	36	3·8
7	42	3·4	34	4·4	44	3·8	40	3·6	40	3·2	40	3·4	42	·6	36	3·4
8	66	3·4	56	3·8	64	3·2	58	4·0	58	3·4	56	3·8	70	3·6	64	3·6
9	60	4·2	64	4·2	68	4·0	68	4·2	72	3·8	64	4·4	72	3·8	72	4·0
10	50	3·0	28	3·6	52	3·4	28	4·0	34	3·0	30	4·2	50	3·0	38	4·0
11	28	4·6	14	3·6	16	4·2	14	4·2	14	4·0	12	4·2	16	4·0	18	4·2
12	30		12	3·4	30	3·8	14	3·2	30	3·6	14	3·4	40	3·4	12	3·2
13	8		10	3·4	8	3·4	12	2·8	10	3·0	14	3·4	10	3·4	12	3·4
14	42		16	4·4	22	3·0	18	4·2	24	3·0	—		32	3·0	20	3·8
17	48	3·4	36	4·2	50	3·0	40	4·6	—		—		—		—	

APPENDIX No. XXI.

Handed in by Mr. W. W. Fisher. (Q. 8864.)

Table of Milks between 11·5 and 12·5 per cent. of Solids, with 2·5 to 4·0 per cent. of Fat.

The number of samples included in the table is 171, of which 40 are below the limit of 3·0 fat, and 55 below the limit of 8·5 per cent. non-fatty solids, 76 being classed as genuine.

With a limit of 3·2 for fat a further number of 21 samples would be condemned, leaving 55 samples classed as genuine.

——	3 % Limit.	3·2 % Limit.
Watered	55	55
Skimmed	40	61
"Genuine"	76	55
	171	171

The double lines show the limits of 8·5 for non-fatty solids and 3·0 for fatty solids; the dotted line shows a limit of 3·2 for the latter. The limit of 12·0 total solids is shown by the vertical lines.

Fat	TOTAL SOLIDS.										
	11·5	11·6	11·7	11·8	11·9	12·0	12·1	12·2	12·3	12·4	12·5
2·5	9·0 2·5	9·1 2·5	9·2 2·5	9·3 2·5	9·4 2·5	9·5 2·5	—	—	—	—	—
2·6	8·9 2·6	9·0 2·6	9·1 2·6	9·2 2·6	9·3 2·6	9·4 2·6	9·5 2·6	—	—	—	—
2·7	8·8 2·7	8·9 2·7	9·0 2·7	9·1 2·7	9·2 2·7	9·3 2·7	9·4 2·7	9·5 2·7	—	—	—
2·8	8·7 2·8	8·8 2·8	8·9 2·8	9·0 2·8	9·1 2·8	9·2 2·8	9·3 2·8	9·4 2·8	9·5 2·8	—	—
2·9	8·6 2·9	8·7 2·9	8·8 2·9	8·9 2·9	9·0 2·9	9·1 2·9	9·2 2·9	9·3 2·9	9·4 2·9	9·5 2·9	-
3·0	8·5 3·0	8·6 3·0	8·7 3·0	8·8 3·0	8·9 3·0	9·0 3·0	9·1 3·0	9·2 3·0	9·3 3·0	9·4 3·0	9·5 3·0
3·1	8·4 3·1	8·5 3·1	8·6 3·1	8·7 3·1	8·8 3·1	8·9 3·1	9·0 3·1	9·1 3·1	9·2 3·1	9·3 3·1	9·4 3·1
3·2	8·3 3·2	8·4 3·2	8·5 3·2	8·6 3·2	8·7 3·2	8·8 3·2	8·9 3·2	9·0 3·2	9·1 3·2	9·2 3·2	9·3
3·3	8·2 3·3	8·3 3·3	8·4 3·3	8·5 3·3	8·6 3·3	8·7 3·3	8·8 3·3	8·9 3·3	9·0 3·3	9·1 3·3	9·2 3·3
3·4	8·1 3·4	8·2 3·4	8·3 3·4	8·4 3·4	8·5 3·4	8·6 3·4	8·7 3·4	8·8 3·4	8·9 3·4	9·0 3·4	9 1 3·4
3·5	8·0 3·5	8·1 3·5	8·2 3·5	8·3 3·5	8·4 3·5	8·5 3·5	8·6 3·5	8·7 3·5	8·8 3·5	8·9 3·5	9·0 3·5
3·6	7·9 3·6	8·0 3·6	8·1 3·5	8·2 3·6	8·3 3·6	8·4 3·6	8·5 3·6	8·6 3·6	8·7 3·6	8·8 3·6	8·9 3·6
3·7	7·8 3·7	7·9 3·7	8·0 3·7	8·1 3·7	8·2 3·7	8·3 3·7	8·4 3·7	8·5 3·7	8·6 3·7	8·7 3·7	8·8 3·7
3·8	7·7 3·8	7·8 3·8	7·9 3·8	8·0 3·8	8·1 3·8	8·2 3·8	8·3 3·8	8·4 3·8	8·5 3·8	8·6 3·8	8·7 3·8
3·9	7·6 3·9	7·7 3·9	7·8 3·9	7·9 3·9	8·0 3·9	8·1 3·9	8·2 3·9	8·3 3·9	8·4 3·9	8·5 3·9	8·6 3·9
4·9	7·5 4·0	7·6 4·0	7·7 4·0	7·8 4·0	7 9 4·0	8·0 4·0	8·1 4·0	8·2 4·0	8·3 4·0	8·4 4·0	8·5 4·0

APPENDIX No. XXII.

Handed in by Mr. W. W. Fisher. (Q. 8906.)

Copy of labels used by Inspector, and page of his book in which particulars of purchase, &c. are recorded.

Note.—Four of these are printed on one page, and all filled in with details before being divided, three being then gummed on the samples.

County of Berks.—Sale of Food and Drugs Act.

Sample of ______________________________

From ______________________________

____

Superintendent John Gamble,
County Police Station, Reading.

Date ______________________________

No. of Sample Analyst's C. No. ______________________________

Name and Address of Person ______________________________

Name and Address of Person from whom received ______________________________

Nature of Sample, Quantity, price paid ______________________________

Date when purchased or received ______________________________

Date and place of delivery to Analyst ______________________________

Quantity retained ______________________________

Results of Analysis when Certificate received ______________________________

Whether proceedings taken ______________________________

Result of proceedings ______________________________

Remarks ______________________________

APPENDIX No. XXIII.

Handed in by Mr. E. J. Bevan. (Q. 8917.)

Results of Analyses of Samples of Milk received during May and June 1896–9.

All Districts, excluding watered samples.

May and June.	Below 2·5.	2·5 to 2·75.	2·75 to 3·00.	3·00 to 3·25.	3·25 to 3·50.	3·50 to 4·00.	Above 4·0	Total.
1896 - - - -	None.	4	15	39	45	39	16	158
Per cent. - -	—	2·53	9·49	24·68	28·48	24·68	10·12	—
1897 - - - -	5	7	30	33	25	29	16	145
Per cent. - -	3·45	4·83	20·69	22·75	17·24	20·00	11·03	—
1898 - - - -	2	3	16	49	37	59	27	193
Per cent. - -	1·03	1·55	8·29	25·39	19·17	30·57	13·99	—
1899 - - - -	1	12	24	58	59	101	55	310
Per cent. - -	0·32	3·87	7·74	18·71	19·03	32·58	17·74	—
Totals - -	8	26	85	179	166	228	114	806
Per cent. -	0·99	3·23	10·54	22·21	20·59	28·29	14·14	—

All Districts. All Samples.

May and June.	Mean per cent. of fat.
1896 - - - - - - - - -	3·409
1897 - - - - - - - - -	3·358
1898 - - - - - - - - -	3·519
1899 . - - - - - - - -	3·714

Mean per cent. for all years, 3·543.

APPENDIX No. XXIV.

Handed in by Mr. H. DROOP RICHMOND. (Q. 8300.)

MEMORANDUM explanatory of Tables.

In the consideration of what deficiency of any of the normal constituents of milk shall cause a presumption that the milk is not genuine to be raised, the average amount of those constituents is of comparatively minor importance. It would certainly cause a strong presumption that the milk was not genuine if the deficiency in any constituent amounted to the greatest found in any sample of milk.

In Tables 1 and 2 are given the results of analyses of 6,462 samples of milk from single cows; solids not fat being in Table 1, fat in Table 2. From these it is seen that the lowest figures (greatest deficiencies) are, for fat 1 per cent., and solids not fat 4·9 per cent. It is at once manifest that such figures adopted as limits would be farcical. It is also apparent that on mixing the milk of several cows the lowest figures would be eliminated.

It is the practice almost universally to send milk from farm to dairy in churns holding 17 gallons or less. It would be fairer to consider the churn as the unit. A difficulty arises here, as not infrequently cream is removed from one churn and put in another by various means. In order to give full weight to all reasonable conditions, and to avoid taking the lowest figures alone (which may be fictitiously low), I have made what may be termed an actuarial valuation of the results.

This is obtained by the formula:—

$$\text{Limit} = \text{Mean} - 2\sqrt{\frac{\Sigma\ d^2}{n-1}}$$

$\Sigma\ d^2$ = sum of the squares of the differences of individual results from the arithmetic mean and n = the number of results.

In Table 3 are given the probable deviation from mean, and the calculated standard for each month since January 1894 to December 1899. From these it is seen that on the whole the limits of the Society of Public Analysts, 3·0 per cent. of fat and 8·5 per cent. of solids not fat, are reasonable. It is also apparent that the fat standard might be lowered in May and June, and raised in the winter, while in July, August, and September the solids not fat standard might be lowered. Comparatively little importance should be attached to the solids not fat standard, as the majority of genuine samples falling below 8·5 per cent. can be distinguished from adulterated samples by making determinations of the milk sugar, proteids and mineral matter.

To show how the proposed standards would work in practice Table 4 has been prepared; this contains the highest and lowest percentages of fat in the milk sent out daily by the Aylesbury Dairy Company from January 1, 1894, to December 31, 1899.

In fixing a standard, the method used has to be taken into consideration; the figures for fat submitted have been determined in the majority of instances by the Leffmann-Beam or Gerber methods, and these methods have been carefully checked against gravimetric methods, great care having been taken to guard against the results being too high. From comparison with other analysts, it appears that the "personal equation" has resulted in the figures being slightly below those found by others. The solids not fat have been in most instances calculated, and the formula used is that of Hehner and Richmond, which gives the lowest results; this method of analysis has been deliberately chosen as likely to give more exact results than determination of the total solids and fat by the comparatively crude methods necessary when many samples have to be examined, and the calculation of the solids not fat by subtraction of the fat from the total solids. Tables 5 and 6 give results showing the extent to which the methods used can be depended upon.

I would point out that the calculated standards are low:—

(a) because the methods of analysis chosen are those which have a low tendency.

(b) because by taking single churns into account a reasonable allowance has been made for the milk not being completely mixed.

(c) because by the method of calculation experimental error has been allowed for.

I would urge the necessity of prescribing a method as well as a standard.

Since the decision in the case of Dyke *v.* Gower the question of the rising of cream has only an academic interest; some figures are given in Table 7, illustrating how the fat can vary in milk under favourable circumstances. Though the decision in the above case can be complied with by the exercise of due skill and care, and without any extraordinary precautions, carelessness or disobedience on the part of a subordinate may lead to the conviction of a principal under the Sale of Foods and Drugs Act, which, being a penal act, would render all persons convicted, criminals.

TABLE 1.—PERCENTAGE of SOLIDS NOT FAT in the Milk of Single Cows.

Percentage of Solids not Fat.	Dairy Shorthorn.	Pedigree Shorthorn.	Kerry.	Jersey.	Sussex.	Montgomery.	Welsh.	Red Polled.
	Number of Samples containing the Amount of Solids not Fat given in First Column.							
10·6 - -	1	–	1	–	–	–	–	–
10·5 - -	2	–	1	–	–	–	–	–
10·4 - -	–	–	–	3	–	–	–	–
10·3 - -	4	–	–	–	1	–	–	–
10·2 - -	7	–	–	7	1	–	–	1
10·1 -	5	–	1	2	1	–	–	1
10·0 - -	2	–	3	3	2	2	–	–
9·9 - -	9	–	2	11	3	–	–	2
9·8 - -	11	2	1	11	6	–	–	3
9·7 - -	17	2	12	20	9	–	–	2
9·6 - -	34	9	20	20	9	1	1	5
9·5 - -	41	24	53	29	9	6	3	4
9·4 - -	84	30	69	46	9	5	2	7
9·3 - -	151	32	119	41	13	10	2	14
9·2 - -	195	82	151	37	10	6	5	8
9·1 - -	224	89	203	51	13	16	1	16
9·0 - -	318	157	202	25	10	10	2	24
8·9 - -	364	174	180	37	12	4	2	22
8·8 - -	352	166	161	18	7	8	–	24
8·7 - -	311	151	129	12	7	8	–	14
8·6 - -	272	138	71	16	5	3	–	10
8·5 - -	192	105	53	8	3	–	–	6
8·4 - -	108	70	23	2	2	4	–	6
8·3 - -	62	30	22	2	–	2	–	7
8·2 - -	36	9	6	2	–	1	–	–
8·1 - -	12	9	3	1	–	1	–	–
8·0 - -	15	7	–	–	–	–	–	3
7·9 - -	10	2	2	–	–	1	–	1
7·8 - -	5	1	–	–	–	–	–	–
7·7 - -	3	2	–	–	–	–	–	2
7·6 - -	2	1	1	–	–	–	–	–
7·5 - -	–	–	–	–	–	–	–	2
7·3 - -	–	–	–	–	–	–	–	1
7·1 - -	–	–	–	–	–	–	–	1
6·6 - -	–	–	1	–	–	–	–	–
6·2 - -	–	–	1	–	–	–	–	–
6·1 - -	–	–	1	–	–	–	–	–
4·9 - -	–	–	1	–	–	–	–	–

SYNOPSIS.

	No. of Samples.	Maximum.	Minimum.	Average.
Dairy Shorthorn - - - -	2,849	10·6	7·6	8·87
Pedigree Shorthorn - - -	1,292	9·8	7·6	8·83
Kerry - - - - - - -	1,493	10·6	4·9	8·98
Jersey - - - - - - -	404	10·4	8·1	9·23
Red Polled - - - - - -	186	10·2	7·1	8·88
Sussex - - - - - - -	132	10·3	8·4	9·31
Montgomery - - - - -	88	10·0	7·9	9·02
Welsh - - - - - - -	18	9·6	8·9	9·24

Table 2.—Percentage of Fat in the Milk of Single Cows.

Percentage of Fat.	Dairy Shorthorn.	Pedigree Shorthorn.	Kerry.	Jersey.	Sussex.	Montgomery.	Welsh.	Red Polled.
	Number of Samples containing the amount of Fat given in First Column.							
10·5 - -	–	–	1	–	–	–	–	–
10·3 - -		–	1	–	–	–	–	–
10·2 - -	1	–	–	–	–	–	–	–
9·8 - -	–	–	–	1	–	–	–	–
9·7 - -	1	–	–	–	–	–	–	–
9·6 - -	1	–	1	–	–	–	–	–
9·5 - -	1	–	–	1	–	–	–	–
9·4 -	–	–	1	–	–	–	–	–
9·1 - -	1	–	–	–	–	–	–	–
8·8 -	1	–	–	–	–	–	–	–
8·7 - -	1	–	1	1	–	–	–	–
8·6 - -	–	–	–	1	–	–	–	–
8·5 - -	1	–	1	1	–	–	–	–
8·3 - -	1	–	–	2	–	–	1	–
8·2 - -	–	–	2	2	–	–	–	–
8·0 - -	1	–	–	2	–	–	–	–
7·9 - -	–	–	1	–	–	–	–	–
7·8 - -	1	–	–	3	–	–	–	–
7·7 - -	–	–	2	1	–	–	–	–
7·6 - -	–	–	–	2	1	–	–	–
7·5 - -	3	1	1	1	–	–	–	–
7·4 - -	–	–	–	3	2	–	–	–
7·3 - -	–	–	3	9	–	–	–	–
7·2 - -	4	–	3	4	1	–	–	–
7·1 - -	3	–	5	6	–	–	–	–
7·0 - -	–	2	2	7	–	–	–	–
6·9 - -	1	1	5	12	1	–	–	–
6·8 - -	9	1	3	5	–	–	–	–
6·7 - -	7	1	6	10	2	–	–	–
6·6 - -	6	–	8	6	1	–	1	1
6·5 - -	2	–	12	15	3	1	–	–
6·4 - -	6	3	14	9	2	–	2	–
6·3 - -	3	–	13	11	3	–	–	1
6·2 - -	14	–	9	11	1	–	–	–
6·1 - -	14	1	19	14	1	1	1	2
6·0 - -	14	1	22	20	1	–	–	2
5·9 - -	11	–	25	15	4	–	–	–
5·8 - -	15	1	36	18	–	1	–	1
5·7 - -	15	4	29	5	4	–	–	3
5·6 - -	25	2	34	12	3	–	–	2
5·5 - -	38	16	43	16	4	–	–	3
5·4 - -	47	8	35	11	2	1	–	8
5·3 - -	46	13	48	13	5	–	–	5
5·2 - -	62	14	50	18	4	1	2	9
5·1 - -	48	8	51	12	5	1	–	5
5·0 - -	75	25	57	16	5	2	1	5
4·9 - -	83	16	68	16	2	1	–	6
4·8 - -	95	36	63	11	6	2	1	13
4·7 - -	115	39	65	13	2	2	–	7
4·6 - -	108	49	56	9	8	–	–	3
4·5 - -	117	48	59	11	4	1	2	8
4·4 - -	147	70	84	6	10	3	1	9
4·3 - -	166	76	65	4	4	1	–	5
4·2 - -	134	77	64	7	8	–	–	5
4·1 - -	179	98	72	6	4	–	1	7
4·0 - -	169	85	63	6	2	5	–	7

TABLE 2.—Percentage of Fat in the Milk of Single Cows—*continued.*

Percentage of Fat.	Dairy Shorthorn.	Pedigree Shorthorn.	Kerry.	Jersey.	Sussex.	Montgomery.	Welsh.	Red Polled.
	Number of Samples containing the amount of Fat given in First Column.							
3·9 - - -	156	84	40	2	7	2	–	7
3·8 - - -	144	88	43	5	3	5	–	8
3·7 - - -	131	67	39	2	2	8	1	6
3·6 - - -	107	75	40	2	1	5	1	3
3·5 - - -	87	48	20	3	3	4	1	7
3·4 - - -	81	60	36	–	3	4	–	5
3·3 - - -	69	39	14	1	1	3	–	8
3·2 - - -	55	30	12	1	1	4	–	4
3·1 - - -	63	25	12	1	3	6	1	5
3·0 - - -	41	19	10	–	2	5	1	4
2·9 - - -	28	15	6	–	1	3	–	6
2·8 - - -	25	15	7	–	–	5	–	1
2·7 - - -	21	8	7	–	–	3	–	2
2·6 - - -	16	10	2	–	–	1	–	2
2·5 - - -	5	5	1	–	–	–	–	1
2·4 - - -	8	5	–	1	–	1	–	–
2·3 - - -	5	1	–	–	–	2	–	–
2·2 - - -	2	–	–	–	–	1	–	–
2·1 - - -	5	1	–	–	–	1	–	–
2·0 - - -	2	–	–	1	–	–	–	–
1·9 - - -	2	1	–	–	–	–	–	–
1·8 - - -	–	–	1	–	–	–	–	–
1·7 - - -	–	–	–	–	–	1	–	–
1·6 - - -	1	–	–	–	–	–	–	–
1·4 - - -	–	–	–	–	–	1	–	–
1·3 - - -	1	–	–	–	–	–	–	–
1·1 - - -	1	–	–	–	–	–	–	–
1·0 - - -	1	–	–	–	–	–	–	–
TOTAL NO.	2,849	1,292	1,493	404	132	88	18	186

SYNOPSIS.

———	No. of Samples.	Maximum.	Minimum.	Average.
Dairy Shorthorn - - - -	2,849	10·2	1·0	4·03
Pedigree Shorthorn - - -	1,292	7·5	1·9	4·03
Kerry - - - - - -	1,493	10·5	1·8	4·72
Jersey - - - - - -	404	9·8	2·0	5·66
Sussex - - - - - -	132	7·6	2·9	4·87
Montgomery - - - -	88	6·5	1·4	3·59
Welsh - - - - - -	18	8·3	3·0	4·91
Red Polled - - - - -	186	6·6	2·5	4·34
All Breeds - - - - -	6,462	10·5	1·0	–

TABLE 3 A.—1894.

—	Solids not Fat.		Fat.	
	Probable Deviation.	Standard.	Probable Deviation.	Standard.
January	±0·123	8·50	±0·278	3·16
February	0·120	8·48	0·286	2·97
March	0·114	8·49	0·262	2·96
April	0·112	8·43	0·259	2·98
May	0·087	8·55	0·251	2·92
June	0·085	8·55	0·238	2·97
July	0·084	8·45	0·244	3·02
August	0·076	8·52	0·240	3·04
September	0·079	8·57	0·251	3·07
October	0·086	8·56	0·245	3·20
November	0·101	8·60	0·262	3·46
December	0·099	8·60	0·269	3·38

TABLE 3 B.—1895.

—	Solids not Fat.		Fat.	
	Probable Deviation.	Standard.	Probable Deviation.	Standard.
January	±0·106	8·58	±0·240	3·34
February	0·115	8·58	0·255	3·26
March	0·108	8·56	0·230	3·12
April	0·113	8·51	0·241	3·12
May	0·085	8·62	0·241	2·99
June	0·109	8·44	0·210	2·98
July	0·095	8·39	0·231	2·97
August	0·088	8·40	0·242	3·00
September	0·091	8·42	0·234	3·02
October	0·103	8·57	0·279	3·21
November	0·094	8·62	0·278	3·21
December	0·097	8·62	0·258	3·12

TABLE 3 C.—1896.

—	Solids not Fat.		Fat.	
	Probable Deviation.	Standard.	Probable Deviation.	Standard.
January	±0·102	8·61	±0·234	3·12
February	0·111	8·55	0·228	3·12
March	0·097	8·59	0·224	3·13
April	0·103	8·58	0·246	3·01
May	0·081	8·62	0·238	2·90
June	0·093	8·44	0·215	2·93
July	0·087	8·32	0·208	3·03
August	0·080	8·35	0·206	3·20
September	0·096	8·52	0·229	3·25
October	0·096	8·64	0·250	3·22
November	0·096	8·68	0·238	3·26
December	0·103	8·62	0·243	3·27

TABLE 3 D.—1897.

—	Solids not Fat.		Fat.	
	Probable Deviation.	Standard.	Probable Deviation.	Standard.
January - - - - - -	±0·108	8·61	±0·228	3·20
February - - - - -	0·111	8·56	0·238	3·11
March - - - - - -	0·115	8·52	0·235	3·08
April - - - - - -	0·107	8·52	0·236	3·05
May - - - - -	0·093	8·58	0·270	2·85
June - - - - - -	0·099	8·47	0·271	2·84
July - - - - - -	0·098	8·34	0·246	3·00
August - - - - - -	0·100	8·30	0·258	3·11
September - - - - -	0·100	8·45	0·266	3·14
October - - - - - -	0·090	8·56	0·249	3·10
November - - - - -	0·098	8·55	0·288	3·10
December - - - - -	0·109	8·55	0·265	3·16

TABLE 3 E.—1898.

—	Solids not Fat.		Fat.	
	Probable Deviation.	Standard.	Probable Deviation.	Standard.
January - - - -	±0·117	8·43	±0·254	3·09
February - - - - -	0·116	8·42	0·271	3·06
March - - - - - -	0·117	8·44	0·262	3·09
April - - - - - -	0·110	8·48	0·278	3·05
May - - - - - -	0·098	8·58	0·302	2·84
June - - - - - -	0·087	8·53	0·243	2·84
July - - - - - -	0·097	8·38	0·228	3·01
August - - - - - -	0·097	8·30	0·246	3·05
September - - - - -	0·116	8·29	0·229	3·18
October - - - - -	0·115	8·43	0·262	3·20
November - - - - -	0·115	8·48	0·268	3·18
December - - - - -	0·115	8·52	0·250	3·16

TABLE 3 F.—1899.

—	Solids not Fat.		Fat.	
	Probable Deviation.	Standard.	Probable Deviation.	Standard.
January - - - - -	±0·143	8·45	±0·239	3·14
February - - - - -	0·119	8·53	0·261	3·06
March - - - - - -	0·117	8·50	0·229	3·07
April - - - - - -	0·090	8·58	0·221	3·05
May - - - - - -	0·082	8·63	0·246	2·84
June - - - - - -	0·081	8·58	0·218	2·85
July - - - - - -	0·100	8·35	0·196	3·03
August - - - - - -	0·100	8·25	0·208	3·10
September - - - - -	0·117	8·34	0·233	3·16
October - - - - -	0·092	8·58	0·228	3·20
November - - - - -	0·121	8·45	0·246	3·12
December - - - - -	0·117	8·50	0·242	3·03

TABLE 4 A.—TABLE shewing the HIGHEST and LOWEST PERCENTAGE of FAT in MILK sent out on each day in the Year 1894.

—	January.		February.		March.		April.		May.		June.		July.		August.		September.		October.		November.		December.	
.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	4·40	3·40	4·00	3·30	4·10	3·30	4·00	3·30	4·00	3·30	4·05	3·50	3·90	3·45	3·80	3·50	3·90	3·50	4·05	3·45	4·35	3·65	4·40	3·65
2	4·30	3·40	4·00	3·20	4·10	3·30	3·90	3·35	4·10	3·40	4·15	3·35	3·95	3·35	4·00	3·40	4·05	3·50	4·00	3·55	4·30	3·70	4·45	3·60
3	4·10	3·40	4·00	3·30	4·10	3·30	4·10	3·35	3·85	3·15	4·15	3·60	4·20	3·35	3·95	3·45	3·80	3·45	3·95	3.30	4·20	3·65	4·45	3·70
4	4·10	3·40	4·00	3·50	4·00	3·55	4·05	3·30	3·95	3·25	4·10	3·25	4·05	3·55	4·05	3·45	4·15	3·55	4·05	3·50	4·15	3·65	4·55	3·70
5	4·10	3·40	4·10	3·10	4·00	3·45	4·00	3·45	3·85	3·35	4·35	3·40	3·95	3·55	4·00	3·30	4·10	3·50	4·05	3·45	4·20	3·70	4·25	3·65
6	4·30	3·30	4·40	3·20	4·10	3·30	4·00	3·40	3·85	3·30	3·95	3·25	3·95	3·45	3·95	3·35	4·05	3·50	4·05	3·45	4·40	3·55	4·35	3·65
7	4·30	2·50	4·10	3·20	4·00	3·30	4·20	3·40	3·90	3·25	3·95	3·35	3·85	3·50	4·00	3·35	4·10	3·40	4·00	3·60	4·15	3·75	4·40	3·80
8	4·10	3·70	4·30	3·30	4·00	3·40	4·05	3·40	3·95	3·20	3·95	3·35	4·00	3·50	4·00	3·45	4·00	3·25	3·90	3·50	4·10	3·70	4·40	3·65
9	4·40	3·46	4·20	3·30	3·90	3·30	3·90	3·30	4·00	3,20	3·95	3·30	3·95	3·40	3·90	3·30	4·20	3·50	4·25	3·65	4·30	3·75	4·15	3·50
10	4·20	3·50	4·30	3·40	4·00	3·40	4·35	3·30	4·10	3·25	4·00	3·35	4·10	3·45	4·05	3·45	4·05	3·45	4·05	3·45	4·25	3·65	4·40	3·50
11	4·20	3·50	4·00	3·60	4·10	3·40	4·10	3·35	4·05	3·20	3·85	3·20	4·00	3·35	3·90	3·45	4·10	3·50	4·15	3·65	4·15	3·35	4·35	3·50
12	4·00	3·40	4·10	3·20	4·00	3·20	4·00	3·30	4·05	3·20	4·10	3·40	3·90	3·35	4·05	3·45	4·05	3·40	4·15	3·55	4·20	3·70	4·30	3·60
13	4·10	3·40	4·10	3·40	4·30	3·40	4·30	3·25	4·05	3·30	3·90	3·30	3·95	3·35	3·85	3·30	3·90	3·45	3·90	3·65	4·40	3·75	4·35	3·60
14	4·20	3·40	4·10	3·20	4·10	3·20	4·00	3·40	3·85	3·20	4·00	3·20	4·00	3·45	4·05	3·45	4·05	3·50	4·05	3·50	4·65	3·90	4·15	3·60
15	4·20	3·40	3·90	3·40	4·30	3·30	4·20	3·50	4·20	3·30	3·90	3·25	3·90	3·50	3·80	3·40	4·05	3·55	4·15	3·60	4·55	3·90	4·30	3·55
16	4·30	3·40	3·90	3·10	3·90	3·30	4·00	3·25	3·95	3·15	3·90	3·20	3·90	3·25	4·05	3·35	3·95	3·55	4·25	3·60	4·50	3·90	4·45	3·60
17	4·00	3·40	3·90	3·10	4·10	3·40	4·45	3·45	4·00	3·15	3·95	3·30	4·25	3·40	3·90	3·45	3·90	3·50	4·10	3·55	4·40	3·85	4·35	3·60
18	4·09	3·40	4·10	3·40	3·95	3·40	4·25	3·40	4·05	3·25	3·90	3·20	4·10	3·40	3·95	3·35	4.30	3·60	3·95	3·55	4·35	3·60	4·40	3·50
19	4·10	3·40	4·10	3·30	3·90	3·20	4·15	3·35	4·00	3·25	3·90	3·40	4·05	3·45	3·95	3·45	4·20	3·50	4·00	3·55	4·50	3·75	4·20	3·50
20	3·94	3·30	4·30	3·40	4·10	3·20	4·10	3·35	4·05	3·25	4·00	3·35	3·95	3·30	3·85	3·25	4·20	3·55	4·15	3·55	4·55	3·75	4·20	3·65
21	4·20	3·60	4·10	3·40	3·90	3·30	4·05	3·30	3·85	3·10	4·05	3·35	3·95	3·50	4·15	3·35	4·00	3·50	4·05	3·50	4·55	3·80	4·25	3·45
22	4·30	3·40	4·02	3·45	4·00	3·40	3·95	3·40	4·05	3·20	3·85	3·40	3·80	3·50	3·85	3·30	4·00	3·50	4·05	3·45	4·50	3·70	4·10	3·35
23	4·10	3·40	3·90	3·20	4·00	3·40	3·90	3·25	3·95	3·10	4·10	3·35	3·95	3·20	3·85	3·20	4·10	3·40	4·30	3·70	4·50	3·80	4·20	3·30
24	4·13	3·50	4·10	3·30	4·10	3·30	4·25	3·35	3·90	3·30	3·95	3·40	4·30	3·50	4·00	3·20	4·15	3·40	4·20	3·55	4·30	3·60	4·25	3·40
25	4·20	3·30	4·00	3·30	4·10	3·45	4·20	3·30	3·90	3·30	3·95	3·20	4·15	3·35	4·10	3·45	4·30	3·50	4·20	3·60	4·30	3·70	4·20	3·45
26	4·10	3·30	4·10	3·40	4·05	3·45	4·00	3·30	3·95	3·30	4·05	3·35	4·05	3·50	4·15	3·45	4·30	3·45	4·15	3·65	4·50	3·70	4·20	3·45
27	4·10	3·40	4·30	3·40	4·10	3·20	3·95	3·20	4·00	3·20	3·85	3·35	4·00	3·50	4·15	3·45	4·30	3·60	4·00	3·65	4·50	3·65	4·35	3·40
28	4·30	3·50	4·00	3·20	3·90	3·20	3·90	3·35	4·05	3·30	3·95	3·40	4·00	3·55	4·05	3·55	4·15	3·55	4·25	3·55	4·50	3·90	4·15	3·60
29	4·20	3·40	—	—	4·00	3·30	3·80	3·35	4·15	3·30	3·85	3·50	4·10	3·60	4·10	3·50	4·20	3·60	4·05	3·55	4·40	3·80	4·20	3·65
30	4·30	3·20	—	—	3·80	3·30	3·95	3·20	4·00	3·35	3·95	3·45	3·90	3·35	4·05	3·45	4·05	3·55	4·40	3·70	4·40	3·60	4·20	3·55
31	4·10	3·40	—	—	4·10	3·40	—	—	4·00	3·45	—	—	4·50	3·50	3·95	3·45	—	—	4·30	3·70	—	—	4·25	3·55
Maximum during Month	4·40	—	4·40	—	4·30	—	4·45	—	4·20	—	4·35	—	4·50	—	4·15	—	4·30	—	4·40	—	4·65	—	4·55	—
Minimum during Month	—	3·20	—	3·10	—	3·20	—	3·20	—	3·10	—	3·20	—	3·20	—	3·20	—	3·25	—	3·30	—	3·35	—	3·30

TABLE 4 B.—TABLE shewing the HIGHEST and LOWEST PERCENTAGE of FAT in MILK sent out on each day in the Year 1895.

—	January.		February.		March.		April.		May.		June.		July.		August.		September.		October.		November.		December.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	4·25	3·55	4·20	3·50	4·05	3·60	4·00	3·40	4·05	3·35	3·90	3·30	3·90	3·25	4·00	3·45	3·85	3·30	4·05	3·50	4·20	3·55	4·25	3·40
2	4·15	3·50	4·15	3·60	4·15	3·65	4·15	3·45	4·10	3·45	3·95	3·25	4·15	3·15	4·10	3·45	3·85	3·20	4·15	3·40	4·20	3·60	4·45	3·50
3	4·30	3·50	4·05	3·50	4·25	3·55	4·00	3·45	4·00	3·45	3·85	3·15	3·90	3·25	3·90	3·45	3·40	3·30	4·05	3·45	4·35	3·55	4·15	3·50
4	4·20	3·70	4·15	3·45	4·00	3·55	4·00	3·40	4·00	3·40	3·95	3·25	3·95	3·35	4·10	3·60	3·85	3·30	4·20	3·50	4·20	3·65	4·00	3·55
5	4·20	3·55	4·40	3·65	4·15	3·55	4·20	3·55	4·05	3·50	3·85	3·20	3·95	3·40	3·95	3·45	3·90	3·35	4·25	3·70	4·35	3·50	4·25	3·60
6	4·15	3·60	4·25	3·70	4·05	3·55	4·05	3·50	4·15	3·45	3·95	3·25	3·85	3·45	4·20	3·30	3·95	3·30	4·20	3·60	4·40	3·75	4·15	3·50
7	4·35	3·50	4·20	3·70	4·00	3·55	4·00	3·55	4·20	3·35	3·95	3·10	3·95	3·45	4·10	3·35	3·85	3·10	4·10	3·40	4·45	3·65	4·05	3·50
8	4·25	3·55	4·25	3·70	3·90	3·50	3·90	3·45	4·05	3·40	3·85	3·20	3·90	3·35	4·05	3·45	3·95	3·35	4·35	3·45	4·20	3·60	4·15	3·50
9	4·20	3·60	4·30	3·75	4·20	3·65	4·35	3·55	4·15	3·50	3·70	3·30	4·15	3·45	4·10	3·45	3·85	3·40	4·20	3·55	4·35	3·50	4·10	3·35
10	4·05	3·55	4·15	3·75	3·95	3·45	4·05	3·50	3·90	3·50	3·80	3·20	4·00	3·45	4·10	3·35	4·10	3·40	4·40	3·60	4·35	3·55	4·15	3·40
11	4·10	3·60	4·00	3·70	3·90	3·50	4·25	3·45	4·00	3·50	4·05	3·15	3·95	3·40	4·00	3·35	4·05	3·35	4·15	3·60	4·25	3·25	4·00	3·40
12	4·10	3·60	4·30	3·70	4·05	3·40	4·05	3·50	4·00	3·45	3·90	3·15	3·95	3·40	4·05	3·40	4·05	3·45	4·25	3·65	4·60	3·50	4·15	3·45
13	4·15	3·55	4·25	3·60	3·85	3·50	4·00	3·40	3·95	3·30	3·85	3·25	4·20	3·45	4·10	3·35	3·90	3·45	4·15	3·55	4·35	3·55	4·05	3·50
14	4·20	3·80	4·15	3·70	4·00	3·35	4·25	3·65	4·05	3·35	3·75	3·15	3·90	3·45	4·20	3·50	3·90	3·35	4·15	3·55	4·30	3·55	4·15	3·45
15	4·25	3·60	4·15	3·60	4·00	3·40	4·00	3·15	3·95	3·25	3·75	3·30	3·90	3·35	4·10	3·50	3·90	3·35	4·40	3·45	4·30	3·60	4·15	3·45
16	4·25	3·70	4·25	3·70	3·90	3·40	4·20	3·40	4·05	3·35	3·75	3·25	4·15	3·45	3·95	3·45	4·00	3·35	4·15	3·60	4·35	3·55	4·15	3·45
17	4·15	3·70	4·10	3·65	3·85	3·40	4·30	3·35	3·85	3·25	3·70	3·20	4·00	3·35	3·95	3·40	4·10	3·35	4·15	3·55	4·40	3·50	4·25	3·45
18	4·30	3·70	4·00	3·65	3·80	3·40	4·00	3·35	3·90	3·35	3·90	3·35	3·85	3·35	4·00	3·50	3·95	3·35	4·25	3·55	4·25	3·50	4·15	3·50
19	4·25	3·65	4·30	3·50	4·05	3·35	4·15	3·40	3·85	3·25	3·65	3·20	4·05	3·30	4·10	3·30	3·95	3·20	4·25	3·55	4·45	3·65	4·05	3·60
20	4·05	3·65	4·10	3·70	4·10	3·45	4·00	3·50	3·75	3·15	3·75	3·25	3·95	3·30	4·05	3·45	3·95	3·30	4·25	3·65	4·35	3·65	4·05	3·55
21	4·20	3·70	4·15	3·65	4·05	3·45	4·00	3·55	4·00	3·20	3·80	3·25	4·05	3·45	3·95	3·55	4·15	3·45	3·95	3·30	4·40	3·45	4·05	3·30
22	4·25	3·55	4·15	3·60	4·10	3·50	4·10	3·45	3·85	3·20	3·85	3·30	3·95	3·30	4·00	3·40	3·90	3·30	4·35	3·40	4·35	3·35	4·10	3·50
23	4·30	3·70	4·20	3·55	3·90	3·35	4·25	3·30	3·95	3·25	3·80	3·30	4·30	3·40	4·05	3·35	4·00	3·45	4·15	3·60	4·20	3·45	4·00	3·50
24	4·10	3·60	4·10	3·50	4·00	3·50	4·05	3·55	3·85	3·15	3·90	3·25	4·00	3·45	4·15	3·40	4·15	3·45	4·40	3·65	4·25	3·50	4·30	3·40
25	4·15	3·65	3·90	3·60	4·00	3·40	4·00	3·40	3·95	3·15	3·75	3·20	4·20	3·35	3·90	3·45	4·00	3·50	4·35	3·70	4·35	3·55	4·15	3·60
26	4·15	3·65	4·20	3·65	4·05	3·45	4·10	3·45	3·80	3·30	3·75	3·30	4·15	3·40	3·95	3·20	4·00	3·50	4·15	3·60	4·30	3·60	4·25	3·55
27	4·15	3·60	4·15	3·60	4·00	3·45	4·05	3·45	3·75	3·20	3·95	3·35	4·00	3·40	3·90	3·20	3·95	3·15	4·30	3·65	4·25	3·45	4·30	3·35
28	4·15	3·60	4·20	3·50	4·00	3·40	4·00	3·40	4·00	3·25	4·00	3·25	4·10	3·40	3·95	3·20	4·10	3·40	4·10	3·45	4·20	3·65	4·15	3·50
29	4·35	3·60	–	–	3·90	3·45	3·90	3·45	4·00	3·35	3·75	3·25	4·05	3·30	3·75	3·15	4·00	3·20	4·45	3·65	4·15	3·55	4·15	3·55
30	4·15	3·65	–	–	4·00	3·45	4·20	3·35	3·95	3·25	3·95	3·25	4·20	3·40	3·75	3·20	4·05	3·50	4·15	3·65	4·15	3·55	4·15	3·60
31	4·20	3·60	–	–	4·10	3·45	–	–	3·75	3·15	–	–	4·05	3·50	3·85	3·25	–	–	4·25	3·60	–	–	4·20	3·35
Maximum during month	4·35	–	4·40	–	4·25	–	4·35	–	4·20	–	4·05	–	4·30	–	4·20	–	4·15	–	4·45	–	4·60	–	4·45	–
Minimum during month	–	3·50	–	3·45	–	3·35	–	3·15	–	3·15	–	3·10	–	3·15	–	3·15	–	3·10	–	3·30	–	3·25	–	3·30

TABLE 4 C.—TABLE shewing the HIGHEST and LOWEST PERCENTAGE of FAT in MILK sent out on each day in the year 1896.

—	January.		February.		March.		April.		May.		June.		July.		August.		September.		October.		November.		December.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	4·05	3·45	3·95	3·45	3·90	3·40	4·05	3·50	3·95	3·35	3·75	3·10	3·80	3·40	3·90	3·30	4.25	3·60	4·10	3·70	4·25	3·60	4·40	3·70
2	4·00	3·55	4·00	3·50	3·85	3·40	3·95	3·45	3·90	3·40	3·90	3·25	3·90	3·35	3·75	3·50	4·20	3·65	4·15	3·35	4·20	3·65	4·15	3·70
3	4·05	3·50	4·05	3·50	4·20	3·25	4·00	3·50	3·80	3·40	3·80	3·20	3·90	3·30	4·00	3·50	4·30	3·65	4·20	3·45	4·30	3·50	4·25	3·60
4	4·05	3·60	4·15	3·35	3·95	3·50	3·80	3·40	3·85	3·20	3·70	3·15	3·75	3·34	4·15	3·45	4·15	3·45	4·05	3·55	4·10	3·70	4·15	3·55
5	4·05	3·60	3·95	3·50	3·90	3·35	4·05	3·45	3·95	3·35	3·70	3·20	4·00	3·30	3·95	3·55	4·30	3·65	4·15	3·40	4·25	3·50	4·15	3·50
6	4·20	3·55	3·90	3·45	3·95	3·35	3·90	3·40	3·90	3·30	3·85	3·25	3·85	3·15	4·15	3·55	4·15	3·65	4·35	3·65	4·20	3·65	4·20	3·55
7	4·20	3·40	3·95	3·45	3·95	3·40	4·00	3·40	3·80	3·25	3·80	3·25	4·00	3·30	4·20	3·50	4·40	3·50	4·25	3·65	4·20	3·55	4·20	3·50
8	4·10	3·70	3·90	3·25	3·85	3·45	3·90	3·35	3·75	3·35	3·75	3·15	3·80	3·30	4·00	3·50	4·20	3·65	4·30	3·60	4·25	3·60	4·30	3·50
9	4·05	3·60	4·05	3·50	4·05	3·40	3·90	3·35	3·90	3·25	4·00	3·25	4·05	3·15	3·90	3·50	4·20	3·55	4·30	3·50	4·20	3·60	4·20	3·60
10	4·15	3·65	3·95	3·40	4·10	3·35	3·90	3·35	3·70	3·30	3·80	3·20	3·90	3·10	4·00	3·45	4·25	3·60	4·20	3·55	4·20	3·35	4·15	3·60
11	4·05	3·60	4·05	3·45	4·05	3·40	3·95	3·45	3·70	3·25	3·80	3·25	3·90	3·30	4·00	3·50	4·15	3·75	4·15	3·70	4·20	3·55	4·20	3·60
12	4·15	3·60	4·00	3·40	4·00	3·35	3·95	3·50	4·00	3·15	3·80	3·30	3·90	3·35	4·10	3·35	4·10	3·65	4·20	3·60	4·20	3·55	4·20	3·60
13	4·40	3·50	4·00	3·50	4·00	3·45	3·95	3·40	3·75	3·30	3·80	3·35	3·85	3·45	3·95	3·55	4·10	3·60	4·45	3·70	4·15	3·45	4·10	3·60
14	4·20	3·55	3·95	3·40	3·95	3·40	4·10	3·35	3·90	3·20	3·70	3·40	4·20	3·15	3·90	3·50	4·40	3·50	4·25	3·65	4·20	3·55	4·20	3·60
15	4·05	3·60	4·05	3·45	3·95	3·35	4·00	3·40	3·75	3·30	3·75	3.25	3·70	3·30	4·00	3·55	4·25	3·55	4·15	3·60	4·05	3·55	4·30	3·55
16	4·05	3·60	3·90	3·40	3·90	3·35	3·90	3·40	3·85	3·25	3·85	3·30	4·00	3·55	4·00	3·60	4·20	3·55	4·15	3·60	4·30	3·50	4·20	3·65
17	4·05	3·50	3·95	3·45	4·05	3·35	4·05	3·45	3·90	3·30	3·85	3·35	4·20	3·45	4·00	3·45	4·30	3·50	4·25	3·55	4·30	3·15	4·05	3·60
18	4·05	3·50	4·05	3·35	3·95	3·35	3·90	3·35	3·70	3·00	4·05	3·40	4·50	3·40	4·05	3·30	4·20	3·50	4·20	3·65	4·15	3·45	4·30	3·60
19	4·05	3·50	4·00	3·50	4·05	3·45	4·00	3·45	3·90	3·20	3·85	3·40	3·75	3·40	4·00	3·60	4·30	3·55	4·25	3·55	4·10	3·60	4·15	3·60
20	4·15	3·50	3·90	3·45	3·95	3·35	3·90	3·15	3·70	3·35	3·80	3·40	3·95	3·05	4·10	3·60	4·25	3·70	4·40	3·70	4·20	3·50	4·20	3·65
21	4·15	3·55	3·90	3·45	3·90	3·50	4·15	3·30	3·90	3·35	3·80	3·50	4·10	3·35	4·00	3·65	4·25	3·55	4·20	3·70	4·15	3·60	3·95	3·50
22	4·05	3·55	3·90	3·35	3·95	3·50	4·00	3·30	3·90	3·20	3·80	3·30	4·00	3·40	4·00	3·60	4·25	3·60	4·20	3·70	4·20	3·50	4·25	3·55
23	4·05	3·45	3·95	3·45	3·85	3·40	4·20	3·40	3·75	3·10	3·95	3·30	4·25	3·40	4·10	3·65	4·00	3·60	4·20	3·70	4·10	3·45	4·15	3·65
24	4·00	3·50	4·00	3·50	4·05	3·30	4·10	3·40	3·70	3·25	3·70	3.30	4·10	3·40	4·15	3·40	4·25	3·60	4·20	3·60	4·25	3·50	4·20	3·60
25	3·	3·45	4·15	3·40	3·95	3·35	4·05	3·35	3·80	3·10	3·80	3·30	4·00	3·25	4·20	3·40	4·20	3·40	4·00	3·50	4·25	3·50	4·10	3·50
26	4·00	3·45	4·00	3·45	4·10	3.40	4·05	3·50	3·90	3·20	3·75	3·45	3·90	3·30	4·15	3·65	4·25	3·60	4·15	3·60	4·10	3·60	3·90	3·40
27	4·15	3·45	4·10	3·35	3·75	3·50	3·85	3·25	3·75	3·25	3·90	3·40	3·95	3·40	4·20	3·60	4·30	3·70	4·35	3·70	4·30	3·50	4·20	3·50
28	3·95	3·55	3·95	3·40	4·05	3·50	4·30	3·30	3·80	3·20	3·70	3·40	4·10	3·35	4·20	3·65	4·15	3·20	4·10	3·50	4·35	3·60	4·10	3·45
29	4·00	3·50	3·85	3·45	3·90	3·55	4·05	3·40	3·90	3·30	3·65	3·35	3·80	3·40	4·25	3·60	4·30	3·55	4·25	3·55	4·60	3·60	4·25	3·50
30	4·00	3·50	—	—	4·00	3·45	3·90	3·30	3·70	3·20	3·90	3·35	4·00	3·30	4·10	3·70	4·15	3·50	4·25	3·65	4·30	3·55	4·10	3·55
31	4·00	3·50	—	—	4·10	3·40	—	—	3·70	3·20	—	—	3·85	3·30	4·25	3·55	—	—	4·25	3·60	—	—	4·05	3·55
Maximum during Month	4·40	—	4·15	—	4·20	—	4·30	—	4·00	—	4·05	—	4·50	—	4·25	—	4·40	—	4·40	—	4·60	—	4·40	—
Minimum during Month	—	3·40	—	3·25	—	3·25	—	3·15	—	3·00	—	3·10	—	3·05	—	3·30	—	3·20	—	3·40	—	3·15	—	3·40

TABLE 4 D.—Table shewing the HIGHEST and LOWEST PERCENTAGE of FAT in MILK sent out on each Day in the Year 1897.

—	January.		February.		March.		April.		May.		June.		July.		August.		September.		October.		November.		December.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	4·20	3·50	4·05	3·50	4·00	3·30	4·00	3·40	4·10	3·40	4·00	3·15	4·00	3·40	4·20	3·40	4·30	3·75	4·20	3·40	4·00	3·35	4·10	3·60
2	4·00	3·55	4·25	3·50	4·15	3·40	4·10	3·35	4·20	3·25	4·00	3·15	4·00	3·25	4·20	3·40	4·40	3·60	4·10	3·30	4·20	3·20	4·10	3·55
3	4·00	3·50	4·10	3·50	4·00	3·40	4·10	3·40	4·05	3·25	3·90	3·10	4·00	3·40	4·20	3·50	4·50	3·60	4·00	3·50	4·10	3·55	4·40	3·50
4	4·25	3·60	4·00	3·55	4·05	3·60	4·00	3·45	4·10	3·45	3·90	3·15	3·95	3·45	4·40	3·60	4·40	3·70	4·00	3·30	4·15	3·60	4·20	3·45
5	4·25	3·40	4·00	3·55	4·00	3·55	3·95	3·40	4·00	3·30	3·90	3·10	3·95	3·20	4·30	3·20	4·45	3·80	4·30	3·35	4·10	3·55	4·15	3·45
6	4·15	3·55	4·00	3·50	3·90	3·50	4·30	3·40	4·00	3·25	4·00	3·30	4·10	3·35	4·00	3·40	4·10	3·60	4·10	3·40	4·05	3·40	4·10	3·45
7	4·15	3·50	4·00	3·55	3·95	3·40	4·00	3·40	3·95	3·40	3·95	3·15	4·00	3·35	4·10	3·45	4·60	3·65	4·15	3·45	4·05	3·50	4·20	3·50
8	4·00	3·40	4·00	3·45	3·95	3·40	4·15	3·45	4·05	3·25	4·10	3·15	4·00	3·00	4·20	2·90	4·30	3·70	4·00	3·40	4·20	3·40	4·10	3·50
9	4·10	3·50	4·10	3·40	4·20	3·50	4·05	3·30	3·90	3·30	4·10	3·00	3·90	3·25	4·00	3·40	4·15	3·50	3·90	3·30	4·10	3·40	4·20	3·60
10	4·05	3·50	4·10	3·55	4·10	3·40	4·25	3·35	3·85	3·10	4·15	3·25	3·90	3·30	4·10	3·50	4·50	3·60	4·00	3·40	4·05	3·40	4·15	3·50
11	4·10	3·55	4·15	3·55	4·00	3·50	4·20	3·50	4·05	3·25	4·00	3·15	3·90	3·25	4·25	3·60	4·50	3·65	4·10	3·25	4·20	3·40	3·95	3·40
12	4·15	3·40	4·05	3·55	4·00	3·50	3·95	3·35	4·10	3·20	3·90	3·20	3·80	3·30	4·40	3·50	4·40	3·70	4·15	3·40	4·15	3·50	4·20	3·50
13	4·05	3·55	4·10	3·55	4·05	3·45	4·40	3·45	4·00	3·30	3·85	3·30	4·30	3·50	4·10	3·60	4·30	3·40	4·20	3·50	4·25	3·40	4·20	3·45
14	4·10	3·55	4·00	3·55	4·00	3·50	4·20	3·45	3·95	3·30	3·90	3·25	4·20	3·50	4·05	3·40	4·50	3·65	4·10	3·30	4·20	3·40	4·30	3·60
15	4·05	3·50	4·10	3·45	4·00	3·35	4·15	3·40	3·90	3·25	4·05	3·10	3·90	3·50	4·30	3·70	4·45	3·65	4·00	3·45	4·10	3·40	4·10	3·60
16	4·15	3·55	4·15	3·40	4·10	3·45	4·05	3·50	3·90	3·25	4·05	3·25	4·00	3·30	4·00	3·50	4·50	3·50	4·00	3·30	4·50	3·30	4·10	3·60
17	4·05	3·55	3·90	3·50	3·85	3·45	4·00	3·35	3·85	3·15	4·10	3·30	4·40	3·40	4·35	3·45	4·35	3·50	4·10	3·60	4·30	3·60	4·10	3·50
18	4·05	3·55	3·95	3·45	4·00	3·40	4·15	3·50	4·00	3·15	4·10	3·20	4·00	3·30	4·20	3·50	4·15	3·35	4·25	3·40	4·30	3·40	4·10	3·50
19	4·20	3·50	4·00	3·45	4·10	3·40	4·15	3·30	3·90	3·20	4·00	3·25	4·15	3·30	4·10	3·45	4·30	3·50	4·15	3·50	4·20	3·60	4·20	3·65
20	4·10	3·60	4·00	3·50	4·00	3·45	4·10	3·40	4·00	3·15	4·10	3·40	4·10	3·40	4·30	3·55	4·50	3·25	4·10	3·50	4·10	3·40	4·30	3·40
21	4·10	3·55	3·90	3·50	4·00	3·60	3·90	3·35	3·90	3·20	3·90	3·25	4·00	3·30	4·30	3·40	4·60	3·45	4·10	3·65	4·10	3·50	4·30	3·55
22	4·10	3·60	4·00	3·15	4·00	3·35	4·00	3·30	3·90	3·10	4·05	3·20	4·10	3·35	4·20	3·75	4·15	3·55	4 10	3·55	4·00	3·20	4·30	3·60
23	4·10	3·50	4·10	3·35	4·10	3·40	3·95	3·35	3·80	3·30	4·10	3·15	4·00	3·40	4·00	3·60	4·30	3·60	4·20	3·55	4·25	3·20	4·20	3·60
24	4·05	3·65	4·05	3·40	3·90	3·30	4·10	3·50	3·95	3·05	4·00	2·95	4·10	3·50	4·40	3·60	4·80	3·40	4·45	3·60	4·10	3·50	4·10	3·45
25	4·10	3·50	4·00	3·40	3·90	3·45	4·00	3·50	4·00	3·20	3·90	3·30	3·90	3·10	4·30	3·50	4·30	3·50	4·20	3·30	4·15	3·50	4·15	3·60
26	4·20	3·40	4·05	3·45	4·00	3·40	4·10	3·35	3·80	3·15	4·40	3·20	4·00	3·30	4·20	3·55	4·30	3·50	4·20	3·45	4·10	3·40	4·20	3·60
27	4·00	3·45	4·05	3·40	4·00	3·45	4·15	3·40	3·95	3·10	4·10*	3·30	4·30	3·40	4·30	3·55	4·05	3·30	4·00	3·55	4·20	3·50	4·25	3·40
28	4·10	3·45	4·00	3·45	4·10	3·45	4·05	3·35	3·90	3·10	4·10	3·05	4·00	3·40	4·30	3·55	4·20	3·50	4·10	3·40	3·95	3·50	4·25	3·55
29	4·05	3·50	—	—	3·90	3·40	3·90	3·50	3·90	3·15	4·20	3·20	4·10	3·25	4·30	3·70	4·35	3·35	4·10	3·50	4·05	3·50	4·40	3·50
30	4·00	3·60	—	—	4·30	3·50	4·10	3·45	3·95	3·25	4·00	3·35	4·30	3·50	4·40	3·60	4·10	3·10	4·00	3·30	4·50	3·40	4·10	3·45
31	3·95	3·45	—	—	4·05	3·40	—	—	3·90	3·05	—	—	4·25	3·20	4·50	3·55	—	—	4·10	3·45	—	—	4·10	3·55
Maximum during Month.	4·25	—	4·25	—	4·30	—	4·40	—	4·20	—	4·40	—	4·40	—	4·50	—	4·80	—	4·45	—	4·50	—	4·40	—
Minimum during Month.	-	3·40	—	3·35	—	3·30	—	3·30	—	3·05	—	2·95	—	3·00	—	2·90	—	3·10	—	3·25	—	3·20	—	3·40

TABLE 4 L.—TABLE shewing the HIGHEST and LOWEST PERCENTAGE of FAT in MILK sent out in each day in the year 1898.

—	January.		February.		March.		April.		May.		June.		July.		August.		September.		October.		November.		December.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	4·00	3·40	4·20	3·35	4·35	3·55	4·15	3·50	4·15	3·45	3·85	3·25	4·10	3·25	3·95	3·25	4·20	3·60	4·25	3·65	4·40	3·55	4·25	3·65
2	4·20	3·50	4·05	3·40	4·05	3·55	4·20	3·55	4·10	3·40	4·10	3·15	3·85	3·20	4·05	3·25	4·10	3·50	4·25	3·75	4·35	3·25	4·05	3·65
3	4·20	3·50	4·15	3·40	4·25	3·55	4·25	3·30	4·35	3·25	3·95	3·15	4·10	3·35	4·10	3·35	4·10	3·60	4·15	3·65	4·15	3·45	4·15	3·50
4	4·20	3·50	4·15	3·45	4·35	3·50	4·10	3·35	4·35	3·30	4·05	3·15	3·95	3·20	4·15	3·35	4·05	3·55	4·25	3·65	4·20	3·55	4·15	3·35
5	4·10	3·60	4·05	3·60	4·15	3·35	4·45	3·40	4·35	3·35	3·95	3·25	4·05	3·35	4·20	3·25	4·15	3·40	4·15	3·65	4·35	3·45	4·15	3·45
6	4·10	3·50	4·25	3·45	4·25	3·55	4·30	3·45	4·25	3·40	3·95	3·10	3·85	3·25	3·90	3·40	4·30	3·50	4·15	3·65	4·15	3·55	4·35	3·50
7	4·10	3·40	4·05	3·35	4·05	3·45	4·10	3·25	4·15	3·35	4·05	3·20	3·90	3·35	4·00	3·25	4·05	3·50	4·30	3·60	4·30	3·35	4·45	3·35
8	4·20	3·40	4·30	3·45	4·25	3·60	4·15	3·40	4·05	3·30	3·95	3·20	4·05	3·35	4·05	3·45	4·00	3·55	4·40	3·65	4·25	3·45	4·25	3·55
9	4·25	3·50	4·25	3·40	4·15	3·55	4·15	3·35	4·25	3·05	4·05	3·15	3·95	3·35	4·35	3·25	4·10	3·55	4·15	3·75	4·60	3·35	4·30	3·30
10	4·20	3·40	4·05	3·45	4·25	3·45	4·45	3·35	4·45	3·35	3·90	3·05	4·05	3·40	3·90	3·55	4·25	5·45	4·15	3·45	4·45	3·45	4·20	3·55
11	4·20	3·55	4·15	3·45	4·25	3·50	4·15	3·35	4·10	3·15	4·00	3·20	4·05	3·15	4·10	3·35	4·25	3·55	4·35	3·70	4·25	3·50	4·15	3·55
12	4·25	3·45	4·15	3·45	4·10	3·45	4·25	3·35	4·35	3·35	3·85	3·25	4·05	3·35	4·15	3·35	4·05	3·45	4·25	3·70	4·25	3·45	4·10	3·40
13	4·05	3·60	4·05	3·45	4·25	3·45	4·15	3·45	4·05	3·35	3·85	3·25	3·85	3·25	3·95	3·35	4·35	3·55	4·25	3·65	4·15	3·65	4·25	3·50
14	4·20	3·45	4·15	3·45	4·15	3·35	4·05	3·35	4·05	3·35	4·05	2·95	3·95	3·45	4·00	3·50	4·25	3·55	4·30	3·55	4·45	3·30	4·25	3·40
15	4·05	3·60	4·25	3·45	4·25	3·45	4·15	3·55	4·15	3·45	4·05	3·25	4·05	3·45	3·95	3·25	4·30	3·45	4·30	3·65	4·35	3·55	4·05	3·55
16	4·15	3·60	4·25	3·45	4·15	3·35	4·15	3·40	4·05	3·25	3·85	3·15	3·85	3·35	4·15	3·45	4·15	3·45	4·25	3·80	4·15	3·50	4·10	3·40
17	4·25	3·55	4·15	3·45	3·95	3·35	4·25	3·45	4·25	3·40	3·75	3·25	3·95	3·25	4·20	3·25	4·20	3·45	4·30	3·60	4·10	3·65	4·05	3·40
18	4·25	3·45	4·05	3·45	4·15	3·35	4·05	3·35	3·95	3·25	3·75	3·15	4·05	3·25	4·10	3·45	4·15	3·60	4·50	3·65	4·20	3·40	4·05	3·45
19	4·10	3·40	4·05	3·45	4·05	3·45	4·35	3·30	4·05	3·35	3·95	3·05	4·25	3·35	3·95	3·15	4·35	3·25	4·25	3·70	4·45	3·40	4·25	3·35
20	4·10	3·45	4·20	3·60	4·05	3·40	4·20	3·35	4·15	3·25	3·95	3·10	3·95	3·45	3·85	3·50	4·45	3·55	4·30	3·75	4·25	3·45	4·15	3·65
21	4·10	3·45	4·15	3·50	4·15	3·40	4·05	3·45	4·15	3·30	4·25	3·25	4·00	3·35	4·00	3·50	4·20	3·60	4·35	3·25	4·35	3·45	4·25	3·55
22	4·15	3·50	4·25	3·50	4·25	3·25	4·10	3·35	4·05	3·25	3·85	3·10	3·95	3·30	4·00	3·35	4·10	3·45	4·20	3·65	4·40	3·45	4·05	3·45
23	4·05	3·50	4·35	3·45	4·05	3·25	4·25	3·25	3·95	3·05	3·95	3·25	4·05	3·45	4·10	3·35	4·15	3·65	4·25	3·75	4·35	3·50	4·25	3·65
24	4·10	3·35	4·25	3·55	4·05	3·45	4·10	3·45	4·00	3·25	3·85	3·25	4·00	3·35	3·95	3·40	4·30	3·65	4·25	3·50	4·30	3·65	4·15	3·55
25	4·40	3·50	4·15	3·45	4·15	3·50	4·05	3·25	3·95	3·25	4·00	3·25	3·75	3·15	4·20	3·45	4·25	3·55	4·65	3·65	4·55	3·65	4·00	3·55
26	4·15	3·35	4·15	3·50	4·15	3·45	4·35	3·40	4·05	3·25	4·05	3·25	4·10	3·15	4·00	3·45	4·15	3·65	4·35	3·65	4·40	3·55	4·10	3·45
27	4·15	3·45	4·10	3·15	4·20	3·45	4·25	3·35	4·15	3·30	4·00	3·05	4·05	3·30	4·00	3·50	4·30	3·60	4·25	3·55	4·10	3·60	4·40	3·35
28	4·25	3·35	4·15	3·50	4·10	3·35	4·10	3·35	4·05	3·25	4·15	3·25	4·05	3·35	4·20	3·60	4·15	3·45	4·30	3·70	4·05	3·35	4·15	3·55
29	4·10	3·45	—	—	4·35	3·50	4·25	3·45	4·15	3·25	3·85	3·35	4·05	3·45	4·10	3·45	4·25	3·65	4·20	3·50	4·30	3·55	4·05	3·55
30	4·15	3·50	—	—	4·25	3·55	4·10	3·35	3·95	3·05	3·75	3·25	4·20	3·45	4·30	3·60	4·25	3·55	4·25	3·80	4·25	3·75	4·05	3·60
31	4·15	3·35	—	—	4·30	3·25	—	—	4·15	2·95	—	—	4·05	3·45	4·05	3·45	—	—	4·35	3·45	—	—	4·05	3·25
Maximum during Month	4·40	—	4·35	—	4·35	—	4·45	—	4·45	—	4·25	—	4·25	—	4·35	—	4·45	—	4·65	—	4·60	—	4·45	—
Minimum during Month	—	3·35	—	3·15	—	3·25	—	3·25	—	2·95	—	2·95	—	3·15	—	3·15	—	3·25	—	3·25	—	3·25	—	3·25

TABLE 4 F.—TABLE shewing the HIGHEST and LOWEST PERCENTAGE of FAT in MILK sent out on each day in the year 1899.

—	January.		February.		March.		April.		May.		June.		July.		August.		September.		October.		November.		December.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	4·15	3·60	4·20	3·30	4·10	3·50	4·10	3·35	3·80	3·30	3·80	3·10	3·90	3·25	3·90	3·30	3·90	3·45	4·10	3·50	4·10	3·70	3·95	3·35
2	4·05	3·35	4·00	3·40	4·20	3·40	4·40	3·30	4·30	3·35	3·75	3·10	3·95	3·30	3·85	3·35	4·00	3·50	4·15	3·50	4·10	3·50	3·90	3·45
3	4·15	3·45	4·10	3·40	4·10	3·45	4·10	3·20	3·95	3·20	3·85	3·10	4·00	3·10	4·00	3·30	4·05	3·40	4·20	3·50	4·10	3·35	3·90	3·40
4	4·15	3·45	4·10	3·40	4·10	3·40	4·20	3·35	4·10	3·30	3·65	3·10	4·00	3·10	3·80	3·25	4·00	3·40	4·05	3·60	4·10	3·30	4·10	3·35
5	3·95	3·35	4·10	3·40	4·10	3·40	4·20	3·40	4·10	3·30	3·70	2·90	3·80	3·30	3·90	3·40	4·30	3·40	4·10	3·60	4·05	3·50	4·20	3·40
6	3·95	3·35	4·00	3·50	4·10	3·35	4·10	3·30	4·10	3·25	3·80	3·00	3·80	3·25	3·90	3·25	3·90	3·30	4·30	3·20	4·05	3·20	3·90	3·35
7	4·10	3·50	4·20	3·40	4·50	3·40	4·05	3·30	3·95	3·20	3·85	3·00	3·70	3·25	3·90	3·30	4·00	3·35	4·30	3·50	4·20	3·25	4·00	3·30
8	3·95	3·55	4·00	3·35	4·20	3·50	4·20	3·40	3·80	3·30	3·75	3·10	3·75	3·20	4·20	3·20	4·20	3·55	4·10	3·50	4·00	3·40	4·00	3·35
9	3·90	3·35	4·00	3·40	4·00	3·30	4·10	3·50	4·00	3·30	3·90	3·20	3·90	3·30	3·90	3·10	4·00	3·55	4·00	3·30	4·00	3·60	4·30	3·30
10	4·15	3·35	4·10	3·30	4·00	3·40	4·10	3·50	3·90	3·25	3·90	3·10	3·80	3·10	3·90	3·30	4·20	3·60	4·15	3·55	4·10	3·30	4·00	3·45
11	4·00	3·40	4·10	3·30	4·10	3·50	4·30	3·40	4·00	3·15	3 75	3·10	4·05	3·25	4·00	3·40	4·10	3·45	4·10	3·60	4·10	3·50	4·20	3·40
12	4·10	3·50	4·10	3·50	4·30	3·30	4·30	3·45	3·80	3·30	3·70	3·00	3·80	3·20	4·00	3·40	4·15	3·55	4·20	9·50	4·00	3·40	4·20	3·40
13	4·00	3·45	4·20	3·60	4·00	3·30	4·20	3·25	3·80	3·10	3·80	3·10	3·90	3·20	3·80	3·40	4·15	3·60	4·05	3·60	4·00	3·30	4·10	3·30
14	4·00	3·50	4·50	3·60	4·30	3·50	4·10	3·30	4·10	3·15	3·70	3·25	4·00	3·25	3·90	3·30	4·20	3·50	4·10	3·50	4·10	·40	4·00	3·40
15	4·00	3·30	4·15	3·25	4·10	3·40	4·10	3·40	3·90	3·05	3·80	3·15	3·90	3·05	4·10	3·40	4·15	3·60	4·00	3·50	4·00	3·30	4·00	3·45
16	3·95	3·40	4·30	3·30	4·10	3·40	4·10	3·60	4·00	3·20	3·70	3·20	4·00	3·30	3·90	3·50	4·30	3·50	4·10	8·50	4·00	3·35	4·00	3·40
17	4·20	3·50	4·10	3·50	4·20	3·30	4·05	3·20	3·85	3·00	3·50	3·25	3·70	3·25	3·90	3·40	4·30	3·60	4·10	3·45	3·85	3·30	4·00	3·30
18	4·10	3·60	4·20	3·40	4·20	3·30	4·40	3·40	3·90	3·00	3·65	3·10	4·00	3·20	4·00	3·30	4·25	3·40	4·20	3·40	4·00	3·40	3·90	3·30
19	4·00	3·40	4·05	3·40	4·10	3·50	4·00	3·30	3·75	3·20	3·70	3·05	4·00	3·00	4·00	3·40	4·45	3·50	4·05	3·40	4·10	3·50	4·00	3·20
20	4·00	3·45	4·00	3·30	4·00	3·50	4·10	3·30	3·80	3·10	3·95	3·10	3·75	3·30	3·90	3·50	4·00	3·45	4·10	3·35	3·95	3·35	3·90	3·35
21	4·00	3·45	4·40	3·30	4·30	3·40	4·10	3·10	4·00	3·10	3·70	3·00	3·90	3·30	3·90	3·25	4·10	3·50	4·00	3·50	4·00	3·30	3·95	3·35
22	4·20	3·55	4·10	3·60	4·30	3·50	4·20	3·40	3·70	2·90	3·80	3·10	3·75	3·35	4·20	3·40	4·05	3·50	4·10	3·50	3·90	3·30	3·80	3·30
23	4·00	3·35	4·05	3·50	4·10	3·30	4·20	3·30	4·00	3·05	3·70	3·20	4·20	3·30	4·00	3·60	4·00	3·55	4·00	3·40	3·80	3·35	3·90	3·30
24	4·30	3·40	4·10	3·45	4·10	3·40	4·00	3·30	3·90	3·00	3·80	3·20	4·05	3·20	3·90	3·50	4·00	3·40	4·10	3·40	3·95	3·30	4·00	3·40
25	4·10	3·30	3·90	3·40	4·20	3·20	4·25	3·40	3·85	3·15	4·00	3·20	4·00	3·25	4·10	3·40	4·50	3·50	4·00	3·40	3·90	3·30	3·90	3·45
26	4·10	3·55	4·00	3·45	4·20	3·40	4·10	3·40	4·15	3·15	3·90	3·10	3·75	3·20	4·10	3·40	4·90	3·50	4·10	3·50	3·95	3·25	4·00	3·20
27	4·00	3·55	4·10	3·30	4·00	3·40	4·05	3·30	4·00	2·90	4·05	3·00	3·90	3·20	4·10	3·40	4·20	3·40	4·10	3·50	3·95	3·20	4·30	3·35
28	4·10	3·50	4·30	3·40	4·20	3·35	3·95	3·35	3·80	3·10	3·80	3·30	4·05	3·30	4·10	3·30	4·30	3·40	4·15	3·50	4·00	3·30	4·00	3·40
29	3·95	3·50	—	—	4·15	3·40	4·00	3·40	3·85	3·15	3·95	3·35	4·00	3·30	4·10	3·40	4·20	3·50	4·20	3·40	4·00	3·45	4·10	3·50
30	4·10	3·50	—	—	4·10	3·40	3·95	3·30	3·80	3·00	3·90	3·25	3·85	3·30	4·10	3·35	4·20	3·30	4·00	3·35	3·90	3·35	3·90	3·45
31	4·20	3·50	—	—	4·10	3·30	—	—	3·75	3·10	—	—	3·90	3·30	4·10	3·25	—	—	4·20	3·20	—	—	3·90	3·30
Maximum during Month	4·30	—	4·50	—	4·50	—	4·40	—	4·30	—	4·05	—	4·20	—	4·20	—	4·90	—	4·30	—	4·20	—	4·30	—
Minimum during Month	—	3·30	—	3·25	—	3·20	—	3·10	—	2·90	—	2·90	—	3·00	—	3·10	—	3·30	—	3·20	—	3·20	—	3·20

TABLE 5.—DIFFERENCES between FAT ESTIMATIONS by Centrifugal Methods and Gravimetric Analysis.

Difference - - -	0·10 % or under.	0·10 % to 0·15 %	0·15 % to 0·20 %	Over 0·20 %
Number of Samples -	249	32	13	2
Percentage of Total -	84·2 °/。	10·8 °/。	4·4 °/。	0·7 %

Differences between Fat estimated by Gravimetric Analysis and Fat calculated by Richmond's formula.

Difference - - -	0·10 °/。 or under.	0·10 °/。 to 0·15 °/。	0·15 °/。 to 0·20 °/。	Over 0·20 °/。
Number of Samples -	189	55	28	9
Percentage of Total -	67·3 °/。	19·6 °/。	10·0 °/。	3·2 °/。

Differences between the Fat estimated by Gravimetric Analysis by two different analysts on samples which have been divided into three parts.

Difference - - -	0·10 °/。 or under.	0·10 °/。 to 0·15 °/。	0·15 °/。 to 0·20 °/。	Over 0·20 °/。
Number of Samples -	137	49	39	26
Percentage of Fat - -	56·4 °/。	19·5 °/。	15·5 °/。	10·4 °/。

NOTE.—In addition to differences due to personal equation this series would include differences due to the samples not being equally divided.

TABLE 6.—ANALYSIS of Nine SAMPLES of MILK by three different analysts each using various methods.

Mean Results (to indicate variation between methods).

Method.	A.	B.	C.	D.	E.	F.	G.	H.	I.	Mean.
Total Solids :										
Society of Public Analysts -	13·16	13·90	9·68	10·91	12·19	12·36	11·34	16·28	13·35	12·58
Asbestos - - - - - -	13·33	14·06	9·73	10·92	12·27	12·37	11·35	16·11	13·37	12·61
Somerset House - - - -	13·25	14·02	9·92	11·12	12·46	12·51	11·55	16·13	13·48	12·72
Fat :										
Adams (dry ether) - - -	4·25	4·60	·23	2·65	3·12	3·47	3·09	8·21	4·26	3·76
Adams (commercial ether) -	4·25	4·60	·28	2·68	3·13	3·45	3·05	8·21	4·33	3·78
Werner Schmidt - - -	4·20	4·78	·32	2·72	3·18	3·52	3·09	8·72	4·33	3·88
Somerset House - - -	4·24	4·55	·28	2·71	3·16	3·46	3·03	8·26	4·21	3·77
Centrifugal - - - -	4·22	4·53	·18	2·65	3·20	3·52	3·05	7·90	4·24	3·72
Centrifugal (R.) - - -	4·25	4·50	·20	2·70	3·15	3·50	3·05	7·90	4·15	3·72
Solids not Fat :										
Somerset House - - -	9·02	9·46	9·63	8·41	9·33	9·05	8·52	7·86	9·27	8·95
Society Public Analysts—Adams Commercial.	8·91	9·30	9·40	8·23	9·06	8·91	8·29	8·07	9·02	8·86
Society Public Analysts—Werner Schmidt.	8·96	9·12	9·36	8·19	9·01	8·84	8·25	7·56	9·01	8·70
Asbestos—Adams (dry) - -	9·04	9·47	9·54	8·26	9·18	8·95	8·30	7·90	9·16	8·87
Cale (H. & R.) - - - -	8·70	9·10	9·35	8·10	9·00	8·80	8·05	7·50	8·90	8·61

TABLE 6.—Analysis of Nine Samples of Milk by three different analysts, each using various methods—*contd.*

Mean Results obtained by each Analyst (to indicate personal equation).

—	A.	B.	C.	D.	E.	F.	G.	H.	I.	Mean.
Total Solids:										Mean.
B. - - - - - - -	13·20	14·01	9·79	11·01	12·42	12·46	11·49	16·57	13·45	12·73
H. - - - - - - -	13·11	13·81	9·64	10·91	12·13	12·42	11·42	16·02	13·41	12·54
R. - - - - - - -	13·32	14·06	9·82	11·00	12·31	12·41	11·40	16·06	13·38	12·64
Fat:										
B. - - - - - - -	4·25	4·70	·27	2·72	3·22	3·51	3·08	8·51	4·31	3·85
H. - - - - - - -	4·30	4·51	·27	2·63	3·08	3·46	3·08	8·18	4·25	3·75
R. - - - - - - -	4·23	4·60	·24	2·66	3·12	3·44	3·03	8·12	4·24	3·74
Solids not Fat:										
B. - - - - - - -	8·95	9·31	9·52	8·28	9·20	8·95	8·41	8·06	9·14	8·88
H. - - - - - - -	8·81	9·30	9·37	8·28	9·05	8·96	8·34	7·84	9·16	8·79
R. - - - - - - -	9·09	9·46	9·58	8·34	9·19	8·97	8·37	7·94	9·14	8·90

Biggest Differences.

—	A.	B.	C.	D.	E.	F.	G.	H.	I.
Total Solids:									
Society of Public Analysts -	·17	·14	·12	·12	·14	·11	·08	·63	·02
Somerset House - - -	·25	·26	·13	·03	·52	·13	·20	·51	·11
Fat:									
Adams, Commercial ether -	·08	·23	·08	·11	·20	·10	·08	·10	·13
Somerset House - - -	·15	·26	·03	·09	·11	·05	·05	·52	.12

NOTE.—H was milk containing cream, and it was difficult to make the samples identical. Hence the differences are larger than usual.

TABLE 7.—ILLUSTRATING the VARIATIONS of FAT in MILK.

PERCENTAGES of FAT in three churns of milk received together from a farm (March, 1894):

	1.	2.	3.
Percentage of Fat.	6·75 per cent.	1·70 per cent.	2·40 per cent.

FURTHER EXAMPLES of VARIATIONS of FAT in CHURNS.

—	Per cent.	Per cent.	Per cent.	Per cent.
1 - - -	3·30	3·70	4·00	3·30
2 - - -	3·20	3·70	3·00	2·60
3 - - -	4·40	3·90	3·40	3·85
4 - - -	2·10	4·75	3·30	3·45
5 - - -	3·50	3·05	2·80	—
6 - - -	3·40	2·80	—	—
7 - - -	3·75	3·80	—	—

TABLE 7.—Illustrating the Variations of Fat in Milk—*continued.*

Illustrating the variations of fat in milk drawn at intervals from the bottom of a churn when no particular care was taken to keep the milk mixed :

	Percentage of Fat.		Percentage of Fat.
At Start	3·75	After 5th Interval	4·35
After 1st Interval	2·75	„ 6th „	4·45
„ 2nd „	2·70	„ 7th „	4·40
„ 3rd „	2·75	„ 8th „	4·40
„ 4th „	4·10	„ 9th „	4·40

Illustrating the variations of fat in two churns placed side by side in a van, one containing an interior fitting and one not containing an interior fitting :

	Percentage of Fat.	
	Fitted Churn.	Unfitted Churn.
At Start	3·75	3·75
After 1st Interval	3·75	3·10
„ 2nd „	3·65	3·50
„ 3rd „	3·80	4·35
„ 4th „	3·70	4·40

APPENDIX No. XXV.

Handed in by Mr. DROOP RICHMOND. (Q. 8549.)

TABLE showing the Number of Samples containing the Percentages of Fat specified in Milk received during 1894–1899.

Percentage of Fat.	Number of Samples.						
	1894.	1895.	1896.	1897.	1898.	1899.	Total.
6·0 and above	1	2	—	1	—	1	5
5·9 ,,	—	—	—	—	1	—	1
5·8 ,,	—	—	—	—	1	2	3
5·7 ,,	1	—	—	1	1	—	3
5·6 ,,	—	1	—	3	2	—	6
5·5 ,,	4	3	1	2	3	—	13
5·4 ,,	3	2	—	3	5	2	15
5·3 ,,	5	5	2	10	9	2	33
5·2 ,,	22	15	5	7	11	5	65
5·1 ,,	23	18	9	13	16	8	87
5·0 ,,	63	32	26	16	21	19	177
4·9 ,,	88	39	19	37	56	21	260
4·8 ,,	109	65	44	68	82	49	417
4·7 ,,	146	106	91	125	129	46	643
4·6 ,,	229	170	142	170	184	83	978
4·5 ,,	331	243	199	290	300	155	1,518
4·4 ,,	445	342	331	367	434	257	2,176
4·3 ,,	694	477	453	528	609	397	3,158
4·2 ,,	786	636	597	711	727	535	3,992
4·1 ,,	936	809	720	901	986	750	5,102
4·0 ,,	1,031	897	966	1,096	1,162	981	6,133
3·9 ,,	976	1,052	1,061	1,232	1,305	1,271	6,897
3·8 ,,	1,084	1,049	1,240	1,270	1,366	1,454	7,463
3·7 ,,	1,086	1,115	1,276	1,279	1,325	1,554	7,635
3·6 ,,	1,171	1,088	1,240	1,228	1,332	1,573	7,632
3·5 ,,	1,028	932	1,048	1,099	1,096	1,527	6,730
3·4 ,,	866	741	835	831	1,000	1,225	5,498
3·3 ,,	605	561	609	639	754	989	4,157
3·2 ,,	435	364	364	398	484	523	2,568
3·1 ,,	220	183	182	263	232	281	1,361
3·0 ,,	106	69	111	106	164	212	768
2·9 ,,	44	25	30	54	58	78	289
2·8 ,,	20	16	10	19	39	55	159
2·7 ,,	9	3	3	12	22	17	66
2·6 ,,	3	2	3	2	10	8	28
2·5 ,,	1	1	2	2	2	4	12
2·4 ,,	1	—	—	2	—	3	6
2·3 ,,	—	—	—	—	1	—	1
2·2 ,,	—	—	—	—	—	—	—
2·1 ,,	—	—	—	—	—	1	1
2·0 ,,	—	—	—	—	—	—	—
Below 2·0	1	—	—	—	—	1	2
Total	12.573	11,063	11,619	12,785	13,929	14,089	76,058

APPENDIX No. XXVI.

Handed in Major C. E. Cassal. (Q. 9063.)

ST. GEORGE'S, HANOVER SQUARE.

Particulars of Prosecutions under the Sale of Food and Drugs Act, 1899.

Date of Hearing.	Vendor.	Address.	Offence.	Court and Name of Magistrate.	Result.
1900					
April 24	Samuel Buckmaster	200, Ebury Street -	Insufficient label under Section 11.	Mr. Sheil at Westminster Police Court.	Fined 2*l.* and 1*l.* 3*s.* costs.
,, 24	George A. Dowse -	Trading as the Callow Park Milk Company at 74, Horseferry Road, S.W.	No address on the can, Section 9.	Ditto - -	Fined 10*s.* and 2*s.* costs.
,, 25	A. Handsley - -	Trading as the Callow Park Milk Company at Cornwell Yard, Kennington Green.	No address on can or cart.	Mr. Denman at Great Marlboro' Street Police Court.	Defendant ordered to pay 23*s.* costs.
May 9	The Glynde Creameries, 54, Walton Street, Chelsea.	——	No address on cans or cart.	Mr. Kennedy at Great Marlboro' Street Police Court.	Fined 1*l.* and 2*l.* 2*s.* costs.

APPENDIX No. XXVII.

Handed in by Mr. G. Lewin. (Q. 10555.)

A.—Report from Dr. Bell, C.B., F.R.S., Principal of the Laboratory of the Commissioners of Inland Revenue.

In reference to the letter of the Assistant Secretary to the Local Government Board of the 3rd instant, suggesting a report from me in regard to the Tabular results of the Analyses of Genuine Milks with which that Board had been recently furnished, I beg to say that as 10 years had elapsed since our former systematic examination into the composition of genuine milk, and as its quality is more or less affected by the breed of the cows, and by the food they receive, it was considered desirable to make a fresh investigation into the character of the milk now generally produced, in order to ascertain whether any material changes had taken place in the interval in its composition which would affect the limits of quality hitherto relied on as a guide in dealing with samples suspected to have been tampered with.

This investigation into the present composition of genuine milk embraces the composition of 273 single cows, and the mixed milk of 55 dairies. In each case the cows were thoroughly milked in the presence of one of the Assistant Analysts of this Department, and the genuineness of each sample can be substantiated. The samples, which embrace the milk of country farms as well as of town dairies, were collected over a wide area; and the breed of the cows, as well as the kind of food on which they were being fed, was duly noted.

The results show that while there has been a sensible improvement in the quality of milk since our previous investigation 10 years ago, as regards the proportion of fat, the non-fatty solids are in substantial agreement with the results obtained from the samples previously analysed by us. It may be pointed out that 17 per cent. of the samples from individual cows fall below 8·5 per cent. in non-fatty solids, though in very few cases does the percentage fall much below this figure, and that the proportion under 8·8 per cent. amounts to over one-third of the total number, while in the case of the mixed milk of dairies more than one-half of the samples fall below 9·0 per cent.

Laboratory, Somerset House,
15 August 1893.

(Signed) J. Bell.

B.—TABLE showing the RESULTS of the ANALYSES of MILK from INDIVIDUAL COWS.

Date.	Progressive Number.	Breed.	Age in Years.	Time from Calving.	Food, per Day.	Quantity in Quarts at Milking.	Time of Milking.	Time of previous Milking.	Specific Gravity of Milk.	Percentage by Weight of Solids.		
										Not Fat.	Fat.	Total.
October -	1	Shorthorn - - -	5½	3 months	Grass — 4 hours, hay, brewers' grains, 4 lb. linseed cake.	4	3 P.M.	6 A.M.	1031·75	9·01	3·85	12·86
,, -	2	,, - - -	4	6 weeks		7	,,	,,	1031·53	9·12	4·96	14·08
,, -	3	,, - - -	7	2 months		5	,,	,,	1032·59	9·33	4·07	13·40
,, -	4	Jersey - - - -	5½	3 ,,		5	,,	,,	1031·14	9·05	5·78	14·83
,, -	5	,, - - -	5	6 ,,		3	,,	,,	1030·20	8·87	5·47	14·34
,, -	6	Dutch - - -	6	5 ,,	Grass—6 hours, 1 bushel brewers' grains, 2 cabbages.	6	1 P.M.	4.30 A.M.	1029·95	8·20	3·51	11·71
,, -	7	Jersey and Shorthorn -	5	4 weeks		8	,,	,,	1031·45	8·88	5·62	14·50
,, -	8	Shorthorn - - -	3	4 ,,		8	,,	,,	1031·21	9·01	5·40	14·41
,, -	9	,, - - -	10	8 months		4	,,	,,	1030·41	8·33	2·88	11·21
,, -	10	Ayrshire and Shorthorn	7	6 ,,		6	,,	,,	1032·47	9·01	4·08	13·09
,, -	11	Ayrshire - - - -	–	9 ,,	Grass — brought in, 1 bushel brewers' grains, hay.	4	Noon	4 A.M.	1031·04	8·92	4·51	13·43
November	12	,, - - - -	–	9 ,,		3	,,	,,	1032·60	10·04	5·79	15·83
,, -	13	,, - - - -	–	6 ,,		4	,,	,,	1031·76	9·32	4·22	13·54
,, -	14	Shorthorn - - -	–	7 ,,		4	,,	,,	1030·16	8·88	4·44	13·32
,, -	15	,, - - -	–	7 ,,		4	,,	,,	1030·56	8·97	4·88	13·85
,, -	16	,, - - -	3½	2 weeks	Grass—7½ hours, hay, 4 lb. cotton cake.	6	4.30 P.M.	6 A.M.	1032·14	9·32	5·57	14·89
,, -	17	Dutch - - - -	4	2 ,,		6	,,	,,	1031·88	9·04	5·05	14·09
,, -	18	Shorthorn - - -	4	15 months		2	,,	,,	1030·73	8·75	4·20	12·95
,, -	19	,, - - -	4½	4 weeks	As above, with 40 lb. mangels extra.	7	,,	,,	1030·97	8·55	3·95	12·50
,, -	20	Jersey and Shorthorn -	3	3 ,,		7	,,	,,	1030·25	8·20	3·49	11·69
,, -	21	Shorthorn - - -	4	3 months	Grass—4 hours, 1 bushel brewers' grains, 2 cabbages.	6	1 P.M.	4 A.M.	1030·27	8·57	4·46	13·03
,, -	22	,, - - -	3	3 ,,		6	,,	,,	1032·30	8·94	4·53	13·47
,, -	23	,, - - -	10	8 ,,		3	,,	,,	1030·29	8·47	3·88	12·35
,, -	24	,, - - -	5	2 ,,		6	,,	,,	1032·21	9·01	4·42	13·43
,, -	25	Dutch - - - -	7	3½ ,,		4	,,	,,	1031·36	8·98	4·19	13·17
,, -	26	Shorthorn - - -	5	1 month	Grass — 4 hours, 10 lb. chaff, 40 lb. swedes, 30 lb. cabbages, 7 lb. oats.	4	4 P.M.	6 A.M.	1031·26	8·70	5·03	13·73
,, -	27	Jersey and Shorthorn -	9	6 weeks		6½	,,	,,	1032·43	8·72	3·00	11·72
,, -	28	Ayrshire - - - -	5½	7 months		3	,,	,,	1033·96	9·58	4·35	13·93
,, -	29	,, - - - -	4½	5 ,,		2	,,	,,	1031·64	8·68	3·98	12·66
,, -	30	,, - - - -	5½	8 ,,		3	,,	,,	1030·32	8·37	4·35	12·72
,, -	31	Shorthorn - - -	6	3 ,,	Grass—4 hours, ¾ bushel brewers' grains, oat straw, and hay chaff, mangels, 1 peck meal (pea, barley, and wheat).	6	2 P.M.	5 A.M.	1031·83	8·81	3·78	12·59
,, -	32	,, - - -	3½	3 weeks		6	,,	,,	1032·33	9·11	4·48	13·59
,, -	33	,, - - -	2½	5 ,,		5	,,	,,	1030·84	8·48	4·42	12·90
,, -	34	,, - - -	3½	14 months		1½	,,	,,	1031·46	8·75	3·36	12·11
,, -	35	,, - - -	9	3 ,,		6	,,	,,	1032·40	8·92	3·63	12·55
,, -	36	,, - - -	4	4 ,,	Grass—4 hours, hay, and oat straw chaff, 4 lb. cotton and linseed cake, ½ bushel brewers' grains, 1 bushel mangels.	3	2.30 P.M.	,,	1031·77	8·90	4·33	13·23
,, -	37	,, - - -	3	3 ,,		4	,,	,,	1029·72	8·38	4·88	13·26
,, -	38	,, - - -	4	7 ,,		3	,,	,,	1032·57	9·41	4·96	14·37
,, -	39	,, - - -	3½	3 ,,		3	,,	,,	1032·48	8·89	3·58	12·47
,, -	40	,, - - -	5	7 ,,		3	,,	,,	1031·36	8·98	4·99	13·97
December	41	Shorthorn and strain of Jersey.	4	16 weeks	Oat straw chaff, 30 lb. red mangels, 5 lb. bran, 2 lb. wheat and barley meal, hay.	3	3.30 P.M.	6 A.M.	1033·00	9·25	5·91	15·16
,, -	42	Shorthorn - - -	2¾	8 ,,		3	,,	,,	1033·23	9·23	3·72	12·95
,, -	43	,, - - -	9	3 ,,		7	,,	,,	1031·64	8·99	4·04	13·03
,, -	44	Sussex and Jersey - -	9	6 ,,		5	,,	,,	1031·37	8·80	4·58	13·38
,, -	45	Sussex and Shorthorn -	6	8 months		3	,,	,,	1031·72	8·98	3·79	12·77
,, -	46	Shorthorn - - -	–	8 ,,	1 bushel brewers' grains, ½ bushel mangels, hay.	1	11 A.M.	3 A.M.	1030·44	8·79	4·58	13·37
,, -	47	,, - - -	–	6 ,,		1½	,,	,,	1030·18	8·48	3·87	12·35
,, -	48	,, - - -	–	7 weeks		2	,,	,,	1030·57	8·79	4·86	13·65
,, -	49	,, - - -	–	6 ,,		5	,,	,,	1028·34	8·06	4·31	12·37
,, -	50	,, - - -	–	7 months		2	,,	,,	1033·44	9·79	4·70	14·4
,, -	51	,, - - -	–	8 ,,		2	,,	,,	1027·81	7·95	5·24	13·19
,, -	52	,, - - -	–	2 ,,		3	,,	,,	1032·04	8·95	4·58	13·53
,, -	53	,, - - -	–	6 weeks		5	,,	,,	1031·68	8·73	4·80	13·53
,, -	54	,, - - -	–	9 months		1	,,	,,	1032·53	9·02	4·48	13·50
,, -	55	,, - - -	–	9 ,,		1	,,	,,	1033·40	9·53	4·76	14·29

TABLE showing the Results of the Analyses of Milk from Individual Cows—*continued.*

Date.	Progressive Number.	Breed.	Age in Years.	Time from Calving.	Food, per Day.	Quantity in Quarts at Milking.	Time of Milking.	Time of previous Milking.	Specific Gravity of Milk.	Percentage by Weight of Solids.		
										Not Fat.	Fat.	Total.
January -	56	Shorthorn - - -	4	3 weeks	Mangels, straw and hay, chaff (steamed), hay, 2½ lb. cotton cake.	5	2.30 P.M.	6.30 A.M.	1032·20	9·04	4·45	13·49
" -	57	" - - -	9	6 "		5½	"	"	1030·34	8·32	4·09	12·41
" -	58	" - - -	5	6 months		3½	"	"	1032·90	8·99	4·75	13·74
" -	59	Dexter Kerry - - -	7	18 weeks		2	"	"	1029·82	8·43	4·59	13·02
" -	60	Kerry - - - -	4	12 "		3	"	"	1030·72	8·57	4·53	13·10
" -	61	" - - - -	6	5½ months		2½	"	"	1032·84	9·30	5·14	14·44
" -	62	Dutch - - - -	3	3 "		3	"	"	1031·68	8·59	3·34	11·93
" -	63	Jersey - - - -	8	12 weeks		1	"	"	1034·07	9·58	5·49	15·07
" -	64	Shorthorn - - -	–	10 months	½ bushel brewers' grains, ½ bushel mangels, hay.	4	3 P.M.	5 A.M.	1033·98	9·67	4·67	14·34
" -	65	" - - -	–	6 "		4	"	"	1031·90	9·29	5·65	14·94
" -	66	" - - -	–	2 "		3	"	"	1032·63	9·34	4·63	13·97
" -	67	" - - -	–	4 "		6	"	"	1031·36	8·63	3·73	12·36
" -	68	" - - -	–	4 "		5	"	"	1032·55	9·24	4·36	13·60
" -	69	Dutch - - - -	2¾	6 "	1 bushel brewers' grains, ½ bushel mangels, hay.	3½	"	"	1032·62	8·80	3·47	12·27
" -	70	" - - - -	2¾	6 "		2½	"	"	1031·18	8·44	3·50	11·94
" -	71	" - - - -	2¾	6 "		3½	"	"	1032·24	8·68	3·53	12·21
" -	72	Shorthorn and Devon -	6	11 "		2½	"	"	1033·80	9·72	5·36	15·08
" -	73	Shorthorn - - -	7	6 weeks		7	"	"	1031·86	8·86	3·84	12·70
" -	74	" - - -	7	10 months		4	"	"	1030·53	8·45	3·76	12·21
" -	75	" - - -	5	10½ "		4	"	"	1033·72	9·64	4·37	14·01
February	76	" - - -	8	11 "		3	"	"	1032·71	9·50	4·47	13·97
" -	77	" - - -	6	6 "		6	"	"	1030·25	8·61	5·01	13·62
" -	78	Shorthorn and Devon -	3	1 "		6	"	"	1033·65	9·43	4·80	14·23
" -	79	Dutch - - - -	–	2 weeks	½ bushel brewers' grains, ½ bushel mangels hay.	6	"	"	1032·01	8·90	4·73	13·63
" -	80	" - - - -	–	2 "		6	"	"	1030·47	8·44	4·61	13·05
" -	81	" - - - -	–	2 months		8	"	"	1031·60	8·64	3·58	12·22
" -	82	" - - - -	–	2 "		4	"	"	1031·72	8·56	2·85	11·41
" -	83	" - - - -	–	2 "		4	"	"	1031·90	8·69	3·32	12·01
" -	84	Shorthorn - - -	5	6 "	1 bushel brewers' grains, ½ bushel mangels, hay.	7	7 A.M.	4 P.M.	1033·63	9·20	3·35	12·55
" -	85	" - - -	4	7 "		4	"	"	1031·74	8·89	3·68	12·57
" -	86	" - - -	4	7 "		6	"	"	1031·85	8·58	3·36	11·94
" -	87	" - - -	6	10 "		3	"	"	1030·62	8·41	3·18	11·59
" -	88	" - - -	6	5 weeks		9	"	"	1033·76	9·20	3·29	12·49
" -	89	" - - -	–	—	½ bushel brewers' grains, ½ bushel mangels, hay.	4	6 A.M.	4 P.M.	1034·28	9·46	2·85	12·31
" -	90	" - - -	–	—		2	"	"	1032·42	9·18	3·96	13·14
" -	91	" - - -	–	—		2	"	"	1034·73	9·63	3·18	12·81
" -	92	" - - -	–	—		7	"	"	1032·09	8 80	2·61	11·41
" -	93	Shorthorn cross - -	–	—		7	"	"	1032·13	8·98	3·42	12·40
" -	94	Shorthorn - - -	8	4 months	¼ bushel brewers' grains, ½ cwt. mangels, ¼ cwt. chaff, 1 lb. barley meal.	3	5·45 A.M.	5 P.M.	1031·85	8·55	2·90	11·45
March -	95	" - - -	6	3 weeks		6	"	"	1034·16	9·42	3·79	13·21
" -	96	" - - -	8	14 days		7	"	"	1031·04	8·59	3·98	12·57
" -	97	" - - -	4	4 months		3	"	"	1034·56	9·45	3·27	12·72
" -	98	" - - -	6	5 "		3	"	"	1030·76	8·39	3·22	11·61
" -	99	Ayrshire - - - -	5	6 weeks	3 lb. linseed cake, 4 lb. cotton cake, 3 lb. meal (barley, rice, and bean), 4 lb. brewers' grains, 15 lb. mangels, and swedes, all mixed with hay chaff, hay.	4	5 P.M.	6.30 A.M.	1032·31	9·20	4·64	13·84
" -	100	" - - - -	8	6 months		2	"	"	1032·33	9·19	5·85	15·04
" -	101	Shorthorn - - -	9	5 "		4	"	"	1030·61	8·44	3·83	12·27
" -	102	Ayrshire - - - -	5	6 weeks		6	"	"	1031·98	8·93	4·25	13·18
" -	103	" - - - -	8	7 months		4	"	"	1034·26	9·82	4·45	14·27
" -	104	Shorthorn - - -	5	7½ "	½ bushel brewers' grains, 40 lb. mangels, barley straw chaff, hay.	2	"	6 A.M.	1031·43	8·46	3·14	11·60
" -	105	" - - -	4	2½ "		6	"	"	1031·37	8·39	2·80	11·19
" -	106	" - - -	4	6 weeks		7	"	"	1032·11	8·81	3·53	12·34
" -	107	" - - -	5	3 "		8	"	"	1032·39	8·71	3·62	12·33
" -	108	" - - -	5	10 months	¼ bushel brewers' grains, ½ cwt. mangels, oat and wheat straw chaff, 4 lb. linseed and cotton cake, 3 lb. bean and oat meal, hay.	2	6 A.M.	5 P.M.	1027·44	7·79	4·60	12·39
" -	109	" - - -	8	3 "		8	"	"	1031·28	8·24	3·59	11·83
" -	110	" - - -	7	4 "		6	"	"	1030·99	8·47	3·44	11·91
" -	111	" - - -	5	1 "		2½	"	"	1034·95	9·62	3·19	12·81
" -	112	" - - -	8	24 days		10	"	"	1033·03	9·04	3·80	12·84

TABLE showing the Results of the Analyses of Milk from Individual Cows—*continued.*

Date.	Progressive Number.	Breed.	Age in Years.	Time from Calving.	Food, per Day.	Quantity in Quarts at Milking.	Time of Milking.	Time of previous Milking.	Specific Gravity of Milk.	Percentage by Weight of Solids.		
										Not Fat.	Fat.	Total.
March	113	Shorthorn	8	6 months	½ bushel brewers' grains, 18 lb. mangels, 4 lb. maize and bean meal, oat straw chaff, hay.	3½	5 A.M.	4 P.M.	1032·84	8·96	3·75	12·71
„	114	„	6	3 „		7	„	„	1032·79	8·94	3·26	12·20
„	115	„	6	10 days		8½	„	„	1033·00	9·14	4·31	13·45
„	116	„	4	6 months		5	„	„	1032·44	8·90	3·56	12·46
„	117	Welsh	4	5 „		3	„	„	1032·81	9·22	4·33	13·55
„	118	Shorthorn	8	6 „	½ bushel brewers' grains, 18 lb. mangels, 4 lb. maize and bean meal, oat straw chaff, hay.	3	4 P.M.	5 A.M.	1032·66	8·97	3·52	12·49
„	119	„	6	3 „		6	„	„	1032·44	8·96	3·76	12·72
„	120	„	6	10 days		7	„	„	1032·17	8·85	3·60	12·45
„	121	„	4	6 months		4	„	„	1031·77	8·86	4·28	13·14
„	122	Welsh	4	5 „		2½	„	„	1032·64	9·08	4·47	13·55
„	123	Shorthorn	4	2 „	1 bushel brewers' grains, roots, chaff.	4	1 P.M.	4 A.M.	1032·69	9·18	4·20	13·38
„	124	„	7	2 „		6	„	„	1031·31	8·71	3·87	12·58
„	125	„	6	2 „		5	„	„	1033·07	9·61	5·42	15·03
„	126	„	6	4 „		5	„	„	1033·88	9·43	3·36	12·79
„	127	„	4	1½ „		6	„	„	1031·12	8·91	5·41	14·32
„	128	„	7	5½ „	Brewers' grains, mangels, oil-cake, oats, pea-meal, hay.	2½	12.30 P.M.	„	1032·69	9·28	5·72	15·00
„	129	Kerry	10	7 „		2	„	„	1032·07	8·92	4·70	13·62
„	130	Guernsey	9	3 „		4	„	„	1032·85	8·99	4·38	13·37
April	131	„	7	2½ „		4½	„	„	1031·00	8·91	5·76	14·67
„	132	„	5	1½ „		3½	„	„	1033·67	9·55	4·70	14·25
„	133	Shorthorn	6	6 „	1 bushel brewers' grains, mangels, oil-cake, pea-meal, hay.	5	Noon	„	1029·25	8·29	4·20	12·49
„	134	„	7	6 „		5½	„	„	1031·93	9·01	4·47	13·48
„	135	„	6½	5 „		4	„	„	1031·50	8·89	4·81	13·70
„	136	Guernsey	4	3 weeks		4½	„	„	1032·11	9·74	5·79	15·53
„	137	Ayrshire	7½	2 months		8	„	„	1032·95	9·24	4·56	13·80
„	138	„	6	6 „	1 bushel brewers' grains, oil-cake, pea-meal, hay.	5½	3·45 A.M.	5 P.M.	1031·34	8·79	3·61	12·40
„	139	„	6½	4 „		6½	„	„	1033·10	9·03	2·97	12·00
„	140	Shorthorn	7	1 „		9	„	„	1031·88	8·94	3·62	12·56
„	141	„	8	6 „		8½	„	12·30 P.M.	1032·03	8·83	3·09	11·92
„	142	„	6	7 „		10	„	„	1032·48	9·03	3·08	12·11
„	143	„	5	3 weeks	Grass 8 a.m. to 3·30 p.m. Distillers' grains, cake, hay.	9	5 P.M.	5 A.M.	1033·63	9·33	3·66	12·99
„	144	„	5	4 „		8½	„	„	1032·27	8·98	3·49	12·47
May	145	„	8	6 months		8½	„	„	1032·60	9·16	4·38	13·54
„	146	„	7	5 „		8½	„	„	1032·07	8·84	3·48	12·32
„	147	„	8	4 „		10½	„	„	1033·56	9·31	3·24	12·55
„	148	„	10	2 „	Grass during day, cake, oats, brewers' grains, hay.	11½	4 A.M.	Noon	1032·00	8·75	2·76	11·51
„	149	Shorthorn and Guernsey	7	5 „		7	„	„	1034·37	9·73	3·70	13·43
„	150	Shorthorn	7	4 „		7	„	„	1032·46	9·09	3·39	12·48
„	151	„	4	2½ „		7	„	„	1032·77	9·34	3·80	13·14
„	152	„	10	2 „	Grass during day, 10lb. cake, oats and meal, hay.	9¼	Noon	4 A.M.	1031·96	8·84	3·95	12·79
June	153	„	9	2½ „		6½	„	„	1030·92	8·85	4·21	13·06
„	154	„	4	3 „		3	„	„	1032·97	9·23	3·15	12·38
„	155	„	5	3½ „		2½	„	„	1030·17	8·80	4·90	13·70
„	156	Kerry	6	4 weeks		4	„	„	1032·59	9·14	4·41	13·55
„	157	Jersey	8	7 months	Grass	4½	5 A.M.	2 P.M.	1032·05	9·12	5·97	15·09
„	158	Jersey and Shorthorn	7	2 „		9	„	„	1030·18	8·53	3·66	12·19
„	159	Cheshire and Shorthorn	12	Barren		3½	„	„	1031·43	8·79	3·54	12·33
„	160	Jersey and Shorthorn	12	10 weeks		6½	„	„	1033·91	9·33	2·99	12·32
„	161	Sussex and Shorthorn	7	10 „		7	„	„	1033·23	9·15	2·70	11·85
„	162	North Devon	5	5 months	Grass	4	7 A.M.	5 P.M.	1033·77	9·82	4·17	13·99
„	163	„	4	3 „		3	„	„	1035·30	9·83	2·57	12·40
„	164	„	5	2 „		3	„	„	1033·90	9·60	3·59	13·19
„	165	„	6½	10 weeks		3	„	„	1033·78	9·76	3·65	13·41
„	166	„	5½	6 „		4	„	„	1034·95	9·77	3·41	13·18

NOTE.—Samples Nos. 113 to 122 show the quantity and composition of the morning and evening milk, respectively, yielded by the same cows.

Table showing the Results of the Analyses of Milk from Individual Cows—*continued.*

Date.	Progressive Number.	Breed.	Age in Years.	Time from Calving.	Food, per Day.	Quantity in Quarts at Milking.	Time of Milking.	Time of previous Milking.	Specific Gravity of Milk.	Percentage by Weight of Solids.		
										Not Fat.	Fat.	Total.
January -	167	Shorthorn - - -	4	8 weeks	½ cwt. mangels, 4½ lb. cotton cake, wheat and oat straw chaff, hay -	6	5 P.M.	6 A.M.	1030·47	8·87	4·48	13·35
„ -	168	„ - - -	4	14 days		7	„	„	1031·96	9·00	4·22	13·22
„ -	169	„ - - -	5	5 months		4	„	„	1032·44	9·00	3·22	12·32
„ -	170	„ - - -	6	1 „		6	„	„	1032·62	9·18	4·11	13·29
„ -	171	„ - - -	4	3 „		5	„	„	1032·01	8·81	3·56	12·37
„ -	172	„ - - -	6	1 „		8	5 A.M.	4 P.M.	1031·04	8·56	3·27	11·83
„ -	173	„ - - -	4½	2 „		8	„	„	1030·50	8·43	3·38	11·81
„ -	174	Shorthorn and Dutch -	4	11 weeks		5	„	„	1031·63	8·69	3·35	12·04
„ -	175	Shorthorn - - -	6	6 months		6	„	„	1031·48	8·64	3·80	12·44
„ -	176	„ - - -	5	3 weeks		8	„	„	1031·55	8·83	3·79	12·62
„ -	177	„ - - -	5	7 months	¾ bushel brewers' grains, ½ cwt. mangels, ½ peck meal (maize, wheat, barley, oats, beans), 3 lb. cotton cake, chaff, hay -	4	4 P.M.	5 A.M.	1031·39	9·01	4·16	13·17
„ -	178	„ - - -	3	7 „		3	„	„	1032·46	9·15	3·94	13·09
„ -	179	„ - - -	5	3½ „	¾ bushel brewers' grains, ½ cwt. mangels, ½ peck meal (maize, wheat, barley, oats, beans), hay	7	„	„	1032·42	8·88	3·30	12·18
„ -	180	„ - - -	6	6 weeks		11	„	„	1030·17	8·33	3·97	12·30
„ -	181	North Devon - - -	6	7 „		6	„	„	1033·44	9·31	3·16	12·47
„ -	182	Shorthorn - - -	4	4 months		10	5 A.M.	4 P.M.	1031·54	8·51	3·58	12·09
„ -	183	„ - - -	5	6 „		6	„	„	1032·07	8·97	3·51	12·48
„ -	184	„ - - -	4	3 „	¾ bushel brewers' grains, ½ cwt. mangels, ½ peck meal (maize, wheat, barley, oats, beans), hay, 3 lb. cotton cake, chaff -	8	„	„	1032·76	9·10	3·90	13·00
„ -	185	„ - - -	3	4 „		7	„	„	1033·65	9·46	4·11	13·57
„ -	186	„ - - -	4	14 weeks		7	„	„	1031·67	8·67	3·00	11·67
February	187	„ - - -	5	5½ months	¾ cwt. mangels and swedes, oat straw chaff, 4 lb. oats, 13 lb. hay - -	4	4.30 P.M.	5 A.M.	1031·36	8·86	3·42	12·28
„ -	188	„ - - -	6	6 weeks		6	„	„	1032·18	9·07	4·13	13·20
„ -	189	„ - - -	6	6 „		7	„	„	1032·02	8·98	4·19	13·17
„ -	190	„ - - -	5	7 months		3	„	„	1033·83	9·97	5·28	15·25
„ -	191	„ - - -	7	5 „		4	„	„	1032·51	9·09	3·12	12·21
„ -	192	„ - - -	5	8 „	¾ bushel brewers' grains, ½ cwt. mangels, ½ peck meal (maize, wheat, barley, oats, beans), hay	4	4 P.M.	„	1033·93	9·59	4·60	14·19
„ -	193	„ - - -	4	10 weeks		8	„	„	1031·78	8·77	3·38	12·15
„ -	194	„ - - -	5	3½ months		6	„	„	1032·14	9·01	3·19	12·20
„ -	195	„ - - -	6	2 „		10	„	„	1030·92	8·47	3·09	11·56
„ -	196	Shorthorn cross - -	5	10 weeks		8	„	„	1032·21	8·86	3·36	12·22
„ -	197	Shorthorn - - -	7	6 „	Mangels, hay, barley meal, brewers' grains -	6	11 A.M.	3 A.M.	1031·13	8·92	4·82	13·74
„ -	198	„ - - -	5	2 months		8	„	„	1029·27	8·40	4·42	12·82
„ -	199	„ - - -	5	4 „		3	„	„	1033·57	9·66	4·63	14·29
„ -	200	„ - - -	8	6 weeks		7½	„	„	1032·64	9·20	4·57	13·77
„ -	201	„ - - -	8	6 months		4	„	„	1030·06	8·73	5·00	13·73
„ -	202	„ - - -	7	4 weeks	1 bushel brewers' grains, 40 lb. mangels, ½ peck barley meal, 9 lb. hay -	9	3 A.M.	11 A.M.	1032·64	8·39	2·75	11·64
„ -	203	„ - - -	7	4 „		8½	„	„	1032·66	8·92	2·43	11·35
„ -	204	„ - - -	7	2 months		7	„	„	1032·24	8·86	3·12	11·98
„ -	205	„ - - -	8	11 „		5	„	„	1030·24	8·54	3·34	11·88
„ -	206	Dutch - - - -	6	3 „		13	„	„	1031·20	8·54	3·07	11·61
„ -	207	Jersey - - - -	7	4 „		5	„	„	1033·18	9·74	5·54	15·28
„ -	208	Shorthorn - - -	8	11 „		5	„	„	1032·80	9·30	3·76	13·06
„ -	209	„ - - -	6	6 weeks		2	„	„	1028·45	7·90	2·43	10·33
„ -	210	„ - - -	8	7 months		5½	„	„	1031·38	8·77	3·39	12·16
„ -	211	„ - - -	6	6 „		4	„	„	1030·40	8·51	3·15	11·66
„ -	212	„ - - -	8	8 „		3	„	„	1031·30	8·95	3·19	12·14
„ -	213	„ - - -	8	4 weeks		6	„	„	1032·50	9·12	3·26	12·38
„ -	214	„ - - -	5	11 months		3	„	„	1033·78	9·93	5·08	15·01
„ -	215	„ - - -	8	6 weeks		7	„	„	1031·78	8·82	3·46	12·28
March -	216	Shorthorn and Dutch -	6	5 months		6	„	„	1033·38	9·20	3·58	12·78
„ -	217	Ayrshire - - - -	6	4 weeks		9	„	„	1035·13	9·86	2·63	12·49
„ -	218	„ - - - -	12	3 months		5	„	„	1033·56	9·36	3·48	12·84
„ -	219	Shorthorn - - -	8	10 „		5	„	„	1030·80	8·71	3·63	12·34

Table showing the Results of the Analyses of Milk from Individual Cows—*continued.*

Date.	Progressive Number.	Breed.	Age in Years.	Time from Calving.	Food, per Day.	Quantity in Quarts at Milking.	Time of Milking.	Time of previous Milking	Specific Gravity of Milk.	Percentage by Weight of Solids.		
										Not Fat.	Fat.	Total.
March	220	Shorthorn	7	7 weeks	4 lb. linseed and cotton cake, brewers' grains, hay chaff, mangels, hay	6	3.30 P.M.	5 A.M.	1029·16	8·26	3·81	12·07
,,	221	,,	5	12 ,,		5	,,	,,	1029·35	8·28	4·77	13·05
,,	222	,,	6	10 ,,		6	,,	,,	1029·73	8·36	4·77	13·13
,,	223	,,	5	4 ,,		6	,,	,,	1029·59	8·36	4·73	13·09
,,	224	,,	6	6 ,,		6	,,	,,	1029·33	8·22	4·33	12·55
,,	225	,,	5½	4 ,,	1 bushel brewers' grains, 2 lb. linseed cake, hay, hay chaff	3	Noon	4 A.M.	1031·88	8·82	3·77	12·59
,,	226	,,	8	14 ,,		4	,,	,,	1029·75	8·26	3·84	12·10
,,	227	,,	5½	12 ,,		3½	,,	,,	1029·66	8·40	4·13	12·53
,,	228	,,	5	9 ,,		6	,,	,,	1030·99	8·77	4·67	13·44
,,	229	,,	7	2 ,,	4 lb. linseed and cotton cake, brewers' grains, mangels, hay chaff, hay	4½	3.30 P.M.	5. A.M.	1032·64	8·96	3·80	12·76
,,	230	,,	6	2 ,,		5½	,,	,,	1034·00	9·52	4·15	13·67
,,	231	,,	3	3 months		3	,,	,,	1031·41	8·55	2·96	11·51
,,	232	,,	5	12 weeks		4	,,	,,	1026·94	7·52	4·19	11·71
,,	233	,,	6	12 ,,		5	,,	,,	1027·74	7·93	4·10	12·03
,,	234	Shorthorn and Ayrshire	3	14 ,,	4 lb. bean meal, 4 lb. wheat meal, 2 lb. linseed and cotton cake, wheat straw and hay chaff (steamed), hay	4	5.15 P.M.	6 A.M.	1031·37	8·75	3·70	12·45
,,	235	Irish Shorthorn	3	14 ,,		6	,,	,,	1031·87	8·77	2·97	11·74
,,	236	,, ,,	4	2 months		3	,,	,,	1031·20	8·85	3·99	12·84
,,	237	,, ,,	3	3 ,,		4	,,	,,	1031·88	8·99	4·19	13·18
,,	238	,, ,,	3	4 ,,		5	,,	,,	1031·73	8·84	3·52	12·36
April	239	Shorthorn	6	2 ,,	½ bushel mangels, 4 lb. decorticated cotton cake, hay	6	3.30 P.M.	5 A.M.	1030-32	8·46	3·26	11·72
,,	240	,,	7	5 ,,		5	,,	,,	1031·24	8·75	3·92	12·67
,,	241	,,	5	1 ,,		7	,,	,,	1031·89	8·96	4·08	13·04
,,	242	,,	4	6 ,,		4	,,	,,	1032·20	8·92	3·19	12·11
,,	243	,,	3	5 ,,		4	,,	,,	1032·79	9·08	3·53	12·61
,,	244	,,	5	3 ,,	2 lb. cotton meal, 2 lb. decorticated cotton cake, 3 lb. linseed cake, 33 lb. mangels, 6½ lb. oat straw chaff, hay	5½	,,	4.45 A.M.	1030·57	8·45	3·44	11·89
	245	,,	6	5 ,,		5	,,	,,	1030·55	8·48	3·63	12·11
	246	,,	5	3½ weeks		7	,,	,,	1030·48	8·84	5·34	14·18
,,	247	,,	3	4 ,,		3	,,	,,	1030·95	8·61	4·12	12·73
,,	248	,,	6	6 ,,		6	,,	,,	1031·02	8·61	3·31	11·92
,,	249	,,	4	3½ months	As above, and out all day, but little or no grass	5	,,	,,	1031·50	9·00	3·75	12·75
,,	250	,,	4	2 ,,		6	,,	,,	1030·46	8·59	3·72	12·31
,,	251	,,	5	4 ,,		6	,,	,,	1031·71	9·10	3·88	12·98
,,	252	,,	7	6 ,,		4	,,	,,	1029·37	8·39	4·06	12·45
,,	253	,,	5	2 ,,		3	,,	,,	1031·06	8·88	4·10	12·98
,,	254	,,	4	5 ,,		3	,,	,,	1030·80	8·74	3·53	12·27
,,	255	,,	3	11 weeks		5	,,	,,	1030·54	8·62	3·17	11·79
,,	256	,,	5	4 months		2½	,,	,,	1030·71	8·64	3·63	12·27
,,	257	,,	6	6 ,,		4	,,	,,	1031·23	8·64	3·12	11·76
,,	258	,,	5	3 ,,		5	,,	,,	1028·26	8·21	4·65	12·76
,,	259	,,	6	4½ ,,	2½ lb. cotton cake, 35 lb. mangels, hay, put out, but very little grass	5	4 P.M.	5 A.M.	1030·39	8·36	3·85	12·21
May	260	,,	6	4½ ,,		4	,,	,,	1031·09	8·92	3·93	12·85
,,	261	,,	3½	3½ ,,		3	,,	,,	1031·22	8·57	3·79	12·36
,,	262	,,	5	16 days		7	,,	,,	1031·90	9·08	4·55	13·63
,,	263	,,	5	7 months		3	,,	,,	1032·32	9·32	4·52	13·84
,,	264	,,	5	6 ,,		4	5 A.M.	4 P.M.	1031·30	8·93	4·09	13·02
,,	265	,,	6	4 ,,		3	,,	,,	1030·26	8·44	3·52	11·96
,,	266	,,	4½	5 ,,		5	,,	,,	1032·85	8·85	2·96	11·81
,,	267	,,	4½	2 ,,		6	,,	,,	1032·00	8·87	3·80	12·67
,,	268	,,	6	3½ ,,		6	,,	,,	1031·15	8·36	3·39	11·75
,,	269	,,	6	2 ,,	At field, but grass very scarce from drought	4	3.30 P.M.	6 A.M.	1030·82	8·89	3·61	12·50
,,	270	Jersey	3½	6 weeks		4	,,	,,	1030·73	8·96	4·34	18·30
,,	271	Shorthorn	6	1 month.		3	,,	,,	1030·83	8·57	3·23	11·80
,,	272	,,	7	3 months		5	,,	,,	1030·55	8·74	3·54	12·28
,,	273	,,	6	5 weeks		4	,,	,,	1030·40	8·56	3·09	11·65

C.—TABLE showing the RESULTS of the ANALYSES of DAIRY or MIXED MILK.

Progressive No.	Specific Gravity.	Percentage by Weight of Solids.		
		Not Fat.	Fat.	Total.
1	1031·60	9·08	4·28	13·36
2	1032·37	9·25	4·54	13·79
3	1031·20	9·24	4·90	14·14
4	1030·99	8·67	4·13	12·80
5	1032·64	9·36	4·79	14·15
6	1031·86	8·86	4·22	13·08
7	1032·37	9·06	4·30	13·36
8	1031·65	8·82	4·06	12·88
9	1032·65	9·15	3·89	13·04
10	1030·51	8·70	4·38	13·08
11	1032·03	9·01	4·76	13·77
12	1031·07	8·73	5·61	14·34
13	1032·38	8·88	4·24	13·12
14	1032·61	9·17	4·31	13·48
15	1032·64	9·12	4·25	13·37
16	1031·83	8·69	3·90	12·59
17	1033·55	9·22	3·41	12·63
18	1032·55	9·06	3·59	12·65
19	1032·56	8·88	3·63	12·51
20	1030·30	8·48	4·08	12·56
21	1032·22	8·79	2·89	11·68
22	1031·70	8·58	3·39	11·97
23	1032·52	9·07	3·65	12·72
24	1032·03	8·83	3·77	12·60
25	1032·69	9·28	4·17	13·45
26	1031·88	9·06	4·79	13·85
27	1032·41	9·22	4·52	13·74
28	1032·47	9·19	3·70	12·89
29	1032·31	9·29	4·52	13·81
30	1032·83	9·12	3·46	12·58
31	1031·37	8·98	4·69	13·67
32	1032·43	9·12	4·22	13·34
33	1034·41	9·70	3·52	13·22
34	1032·17	9·06	3·92	12·98
35	1031·74	8·82	3·81	12·63
36	1030·12	8·40	3·69	12·09
37	1032·41	9·15	3·71	12·86
38	1032·54	9·13	3·76	12·89
39	1031·87	9·08	4·48	13·56
40	1030·52	8·67	4·40	13·07
41	1031·86	8·75	3·15	11·90
42	1032·53	9·08	3·36	12·44
43	1032·61	9·24	3·79	13·03
44	1030·66	8·60	3·20	11·80
45	1030·16	8·55	4·50	13·05
46	1031·25	8·82	4·68	13·50
47	1031·02	8·75	4·34	13·09
48	1031·51	8·84	3·76	12·60
49	1031·71	8·85	3·70	12·55
50	1032·42	8·96	3·66	12·62
51	1032·06	8·97	3·31	12·28
52	1031·92	8·91	3·26	12·17
53	1031·80	8·84	4·07	12·91
54	1032·11	8·84	3·38	12·22
55	1031·38	8·98	3·68	12·66

D.—TABLE showing the RANGE of QUALITY of the 273 samples of milk from single cows, and the 55 Dairy Samples reported on by Dr. Bell, August, 1893; according to Dr. Liversiege.

Fat.	273 Cows.	55 Dairies.
Under 2·75 per cent.	6 milks 2 per cent.	0 milks 0 per cent.
2·76 to 2·99 ,,	12 ,, 5 ,,	1 ,, 2 ,,
3·00 ,, 3·19 ,,	21 ,, 8 ,,	1 ,, 2 ,,
3·20 ,, 3·49 ,,	37 ,, 14 ,,	8 ,, 15 ,,
3·50 ,, 3·99 ,,	75 ,, 27 ,,	18 ,, 32 ,,
4·00 ,, 4·99 ,,	95 ,, 34 ,,	26 ,, 47 ,,
5·00 and over.	27 ,, 10 ,,	1 ,, 2 ,,

Solids not Fat.	273 Cows.	55 Dairies.
Under 8·00 per cent.	5 milks 2 per cent.	0 milks 0 per cent.
8·0 to 8·29 ,,	10 ,, 4 ,,	0 ,, 0 ,,
8·3 ,, 8·49 ,,	31 ,, 11 ,,	2 ,, 4 ,,
8·5 ,, 8·69 ,,	33 ,, 12 ,,	6 ,, 11 ,,
8·7 ,, 8·99 ,,	95 ,, 35 ,,	21 ,, 38 ,,
9·0 ,, 9·49 ,,	71 ,, 26 ,,	25 ,, 45 ,,
9·5 and over.	28 ,, 10 ,,	1 ,, 2 ,,

E.—EXTRACTED from Table—1891–92—Composition of Milk from Dutch Cows.

Age.	Milking.		Total Solids.	Non-fatty Solids.	Fat.
6 years	5 quarts	November A	11·71	8·20	3·51
4 years	6 ,,	,, A	14·09	9·04	5·05
7 years	4 ,,	,, A	13·17	8·98	4·19
3 years	3 ,,	January A	11·93	8·59	3·34
2¾ years	3½ ,,	,, A	12·27	8·80	3·47
2¾ years	2½ ,,	,, A	11·94	8·44	3·50
2¾ years	3½ ,,	,, A	12·21	8·68	3·53
——	6 ,,	,, A	13·63	8·90	4·73
——	6 ,,	,, A	13·05	8·44	4·61
——	8 ,,	,, A	12·22	8·64	3·58
——	4 ,,	,, A	11·41	8·56	2·85
——	4 ,,	,, A	12·01	8·69	3·32
6 years	13 ,,	February M	11·61	8·54	3·07
Average result of 13 Samples			12·40	8·65	3·75

APPENDIX No. XXVIII.

Handed in by Mr. LEWIN. (Q. 10621.)

(*a*) RESULTS of ANALYSES of samples of COMMERCIAL CREAMS.

DESCRIPTION.	Percentage Composition.		
	Milk Fat.	Non-fats.	Water.
English Thin Cream	39·40	6·58	54·02
,, ,, ,,	33·60	5·74	60·66
	24·44	7·63	67·93
,, ,, ,,	35·67	6·26	58·07
,, ,, ,,	30·74	6·19	63·07
,, Thick ,,	58·77	3·61	37·62
,, Cream	46·21	5·17	48·62
Devonshire Clotted Cream	59·79	6·45	33·76
Norwegian Thin Cream	27·71	6·55	65·74
,, Cream	53·86	3·40	42·74
French Thin Cream	31·84	6·03	62·13
,, Cream	42·40	3·47	54·13
Dutch Cream	46·35	3·88	49·77
,, ,,	46·70	4·58	48·72

APPENDIX No. XXVIII.—*continued.*

Results of Analyses of samples of Condensed Milk examined in the Government Laboratory during the two years 1898 and 1899.

Brand.	Year Examined.	Percentage Composition.					Degree of Concentration.	Percentage Composition (calculated) of Original Milk.			
		Water.	Fat.	Milk Sugar.	Casein.	Ash.		Water.	Fat.	Non-fatty Solids.	Total Solids.
Ideal - -	1898	67·08	10·77	12·53	8·02	1·60	2·49	86·77	4·33	8·90	13·23
Ideal - -	,,	66·21	11·33	12·57	8·36	1·53	2·52	86·60	4·50	8·90	13·40
Ideal - -	,,	63·30	11·32	13·37	10·15	1·86	2·85	87·13	3·97	8·90	12·87
Ideal - -	,,	65·62	11·74	12·51	8·25	1·88	2·54	86·48	4·62	8·90	13·52
Ideal - -	,,	66·48	11·49	11·86	8·25	1·92	2·48	86·47	4·63	8·90	13·53
First Swiss -	1899	61·90	10·69	15·55	9·72	2·14	3·08	87·63	3·47	8·90	12·37
Viking - -	,,	64·47	10·16	14·60	8·69	2·08	2·85	87·54	3·56	8·90	12·46
Ideal - -	,,	63·96	11·72	12·28	10·08	1·96	2·73	86·81	4·29	8·90	13·19
Sledge - -	,,	64·55	10·90	13·44	9·19	1·92	2·76	87·15	3·95	8·90	12·83
Ideal - -	,,	65·96	11·36	13·74	7·02	1·92	2·55	86·65	4·45	8·90	13·35
Superb - -	,,	66·19	9·57	13·06	9·09	2·09	2·72	87·58	3·52	8·90	12·42
Ideal - -	,,	66·74	10·53	12·11	8·69	1·93	2·55	86·97	4·13	8·90	13·03
Sledge - -	,,	64·24	10·81	13·30	9·69	1·96	2·80	87·24	3·86	8·90	12·76
Sledge - -	,,	64·03	10·92	14·06	9·10	1·89	2·81	87·21	3·89	8·90	12·79
Sledge - -	,,	62·40	11·61	15·00	9·01	1·98	2·92	87·12	3·98	8·90	12·88
Sledge - -	,,	64·96	10·38	14·31	8·51	1·84	2·77	87·35	3·75	8·90	12·65
Sledge - -	,,	64·23	11·66	13·39	8·91	1·81	2·71	86·80	4·30	8·90	13·20
Ideal - -	,,	66·09	10·68	11·89	9·42	1·92	2·61	87·01	4·09	8·90	12·99
Superb - -	,,	66·15	10·17	12·52	9·20	1·96	2·66	87·28	3·82	8·90	12·72
Viking - -	,,	63·54	11·03	13·50	9·98	1·95	2·86	87·24	3·86	8·90	12·76
Sledge - -	,,	64·41	11·75	12·48	9·48	1·88	2·68	86·72	4·38	8·90	13·28
First Swiss -	,,	64·98	9·96	14·04	8·96	2·06	2·82	87·57	3·53	8·90	12·43
Viking - -	1900	64·23	9·73	13·98	10·04	2·02	2·93	87·78	3·32	8·90	12·22
Sledge - -	,,	64·60	10·56	13·37	9·52	1·95	2·79	87·32	3·78	8·90	12·68
Viking - -	,,	64·47	10·43	13·49	9·59	2·02	2·82	87·40	3·70	8·90	12·60

APPENDIX No. XXIX.

Handed in by Mr. G. LEWIN. (Q. 10570.)

ANALYSIS OF SOUR MILKS.

The samples of milk purchased under the provisions of the Food and Drugs Acts are usually from three to six weeks old before they are referred to the Government Laboratory by direction of the magistrates.

The milk, when received, is invariably sour, and it is found that certain changes have occurred which are the occasion of some loss of weight in the non-fatty solids of the milk, and more especially as regards the milk sugar, or lactose.

When a sample is kept in a bottle nearly filled with the milk, well corked, and sealed with wax, the changes which occur in the milk are of a different kind to the putrefactive change which takes place during the lapse of an equal period of time in milk freely exposed to the air. In a very few instances, chiefly through the use of an imperfect cork, an unusual change is observed and easily recognised by the presence of mycelial growth. In that case the analysis of the milk is not proceeded with. In the case of kept milks protected from the air, the causes and nature of the change are on the whole of a fairly definite character, and, as stated, mainly affect the milk sugar.

The principal alteration of the sugar which affects its weight is that due to alcoholic fermentation, and as the main product of this change is alcohol, easily recovered by distillation and quantitatively determined, we are enabled to refer this product back to its equivalent in milk sugar, and a close approximation of the true weight of sugar lost is thereby ascertained.

The equation representing the alcoholic change may be shown as follows :—

Hydrated Milk Sugar	=	Alcohol	+	Carbonic Anhydride.
$C_{12}H_{22}O_{11}HO_2$	=	$4C_2H_6O$	+	$4CO_2$
360	=	184	+	176
100 °/o	=	51·1°/o	+	48·9 °/o

This amount is equivalent generally to about 7–10ths of the entire correction needed to correct for the changed matter in the milk.

The slight alteration in weight consequent on the hydrolysis and conversion of milk sugar into lactic acid, and the formation of certain so-called bye-products of alcoholic fermentation are partly positive and partly negative in direction, but their joint effect is too small to have any appreciable influence on the result.

A slight loss also occurs through the alteration of the casein or proteid substance in the milk, due principally to the conditions which arise during fermentative change. Although the amount of the loss due to this cause is very small, the attempt is made to estimate its extent by the determination of the ammonia or ammonia compounds produced, as shown by the application of the Nessler Test, and calculating the ammonia indicated into its equivalent in casein.

As far as the investigation into the changes which occur in kept milks has proceeded, it can be shown that the only quantitative determinations which need be made in order to determine the loss in the non-fatty matter by keeping are the proportion of alcohol and the amount of free volatile acid as acetic, together with the ammonia which is deemed to be derived from the alteration of the casein.

The method has therefore been adopted, not as one which is capable of explaining every possible change which may have occurred in the milk, but as a method of which the net result is that a reasonably accurate estimate is reached of the composition of the milk when in the fresh state. It may be incidentally stated in support of the general validity of the process for the determination of the amount of loss in milk kept for short periods, that when it is applied to milk samples kept unopened for a period of over one year, and in which nearly the whole of the milksugar had suffered alteration—a considerable portion having been converted into alcohol—the results obtained, after accounting for the changes which had occurred, were nearly as concordant with those of the original milks as if they constituted duplicate analyses of the same sample in the fresh state.

The entire correction, which of course is always additive, in the case of a properly-preserved sample from three to six weeks old, is fairly constant, and may be said to range from 0·2 to 0·3 per cent. In a few cases it has been found to be as low as 0·1 per cent, or in bottles only partially filled it has risen to 0·7 or 0·8 per cent.

If the fermentation has passed into the butyric acid stage, the amount of free acid is greatly increased, and owing to the separated casein it is sometimes impossible to get the sample into a proper and uniform condition for analysis. In such cases we decline to proceed with the examination. Such a result, however, practically never happens in the case of samples which have been properly taken and kept by the Inspectors pending the appeal to the Government Laboratory.

The analysis of the milk is conducted by what is known as the "maceration" process, and the weight of the non-fatty solids and fat is independently ascertained in duplicate, whilst as a control the direct determination of the total solids is made on a third portion of milk. Before proceeding with the analysis, the total contents of the bottle are transferred to a suitable vessel and thoroughly mixed with a wire whisk.

From ten to twelve grams of the sample are weighed out into flat-bottomed platinum capsules, each of which has been tared along with a short glass rod with flattened ends. The weighed portions are next neutralised with decinormal strontia solution, with phenolphthalein as indicator. Decinormal soda answers the purpose perfectly well when the degree of acidity is not greater than 10 cc., n/10 solution for 10 grams of milk, but above that amount it is of great advantage to use the strontia solution.

The milk is then evaporated over the water bath until the residue attains the consistency of dry cheese, and while so warm as to ensure that the fat shall be still in the melted condition, 20 cc. of dehydrated ether (s. g. ·720) are poured over the milk solids, which are then carefully stirred for some time with the glass rod. The ether containing the dissolved milk fat is passed through a Schleicher's filter of 10 cm. diameter, which has previously been dried and weighed in a weighing bottle. The maceration of the milk is continued with eight successive additions of 10 cc. of ether, at which point it has been found that the fat has been wholly separated from the non-fatty solids. The filter-paper having its edges cut down, is well washed with boiling ether, and the fractions of the filter-paper are replaced in the weighing bottle and dried at 100°C. The increase of weight, which with careful work should not exceed a few milligrams, is added to the weight of the non-fatty solids. At the conclusion of the maceration process, the non-fatty solids should be in a fine state of division, resembling the precipitated chalk of pharmacy. The capsules are next dried overnight in the water oven and the first weighing is taken in the morning. Usually the weight is constant by this time, as shown by the weighings taken during the day. As from the conditions of the analysis the anhydrous salts of sodium or strontium are present in the dried solids, the correction for the added alkali is in the proportion of ·0022 gram per 1 cc. of n/10 soda used and ·0042 gram for each cc. of the strontia solution required.

The ether solution of the milk-fats contained in tared beakers is evaporated and the weight of the dried fat ascertained.

In determining the nature and amount of the loss in non-fatty solids consequent on keeping, the alcohol present is by far the most important item. When the milk sample under analysis measures 170 cc., that is nearly 6 ounces (and it should not be much less than this), 75 grams of the milk can be spared for distillation, which is carried out in a glass still, with glass spiral condenser.

The acidity of the milk having been previously ascertained, the portion for distillation is neutralised with soda up to one-half of the total acid present. If nearly neutralised, ammonia may pass into the distillate and so vitiate the result. The first distillate, which usually contains a little acid, is re-distilled with the addition of 0·5 cc. n/10 NaHO, and, after having been made up to original bulk, the specific gravity at 15·5°C (60°F) is taken in a 50 gram or in a 1,000 grain weighing bottle. Supposing that the distillate gave a specific gravity of 999·67 or 0·33 less than 1,000, then this difference multiplied by 1·16* gives the amount of proof spirit by volume present in the milk. The product multiplied by ·842, equals the actual weight of anhydrous milk sugar which has been converted into alcohol.

The correction for free volatile acid, reckoned as acetic acid, is ascertained as follows :—

10 grams of the milk are neutralised to the extent of one-half the total acidity with n/10 NaHO, and a little phenolphthalein added. The mixture is then evaporated to dryness on a water bath with frequent stirring, and after treatment with 20 cc. of boiling distilled water so as to break up and thoroughly detach the milk solids from the capsule, a further addition of n/10 NaHO is made, until the neutral point is reached. The difference between the original acidity of the milk and that of the evaporated portion is regarded as acetic acid. The number of cc's. of soda shown, when multiplied by ·425, gives the percentage of loss by weight not recovered in the change of milk sugar into alcohol and thence into acetic acid.

Example :—
Acidity of milk - - - 11·6 cc. n/10 NaHO.
" " evaporated portion - 9·2 " "
Difference - - - 2·4

2·4 × ·0255 = ·061 per cent. by weight lost,
or
2·4 × ·006 × 10 × ·425 = ·061 " " "

The loss arising from the change in the casein is very small.

To estimate it, two grams of the milk are made up to 100 cc. with distilled water and filtered to a clear solution. 10 cc. of the filtrate increased to 50 cc. by the addition of distilled water, are Nesslerised against NH_4Cl solution, equivalent to .01 mgr. of NH_3 in each cc. As the Nessler colour produced in presence of milk differs somewhat from that of pure saline ammonia, the blank experiment is carried out with the addition of 10 cc. of the filtrate from two grams of new milk slightly acidified, and diluted to the same extent as the sour milk. The quantity of test ammonia required varies between 0·5 cc. and 4 cc.

In the case of a milk containing ammonia equal to 2·6 cc. of the test solution, the loss of weight is calculated as follow :—

·00001 mgms. × 2·6 × 500 × 5·2 ·067 per cent. casein
or $\frac{2·6 \times ·052}{2}$ ·067 " "

It is evident that any other degree of dilution may be conveniently adopted according to circumstance, or the proportion of ammonia which might be indicated in the milk.

According to the three instances given, the loss of solids, or in other words the addition to be made to the non-fatty solids, is as follows :—

Loss from Alcohol - - - ·322°/o
" Acetic Acid - - ·061°/o ·45°/o
" Ammonia - - ·067°/o

The following table (p. 406) gives the results of the analysis of a series of milks analysed in the fresh state and after a lapse of several weeks. The examination was carried beyond the point of time at which a milk can be referred under the Amending Act of the Food and Drugs Act, 1875, but it will be seen that the changes can be accurately followed and allowed for, and the comparison of the corrected non-fatty solids with the solids of the fresh milk shows that the variations are not greater than may occur in duplicate determinations of the constituents of a fresh milk.

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* This factor has been deduced from Gilpin's Tables as applicable to such small quantities of alcohol as are found in sour milk. (1,000—999·67) × 1·16 × ·842 = ·322 by weight of milk-sugar lost.

WHOLE MILKS.

No.	Fresh Milk.		Kept Milk.			Total Loss.	
	Non-fatty Solids.	Fat.	Time in Days.	Non-fatty Solids.	Fat.	Calculated.	Actual.
(1)	8·97	4·08	21	8·71	4·02	·20	·26
(1a.)	8·97	4·08	27	8·74	3·97	·21	·23
(1b.)	8·97	4·08	50	8·61	4·00	·34	·36
(1)	8·97	4·08	85	8·49	4·09	·49	·48
2	8·99	3·17	27	8·60	3·16	·35	·39
3	9·12	4·16	42	8·82	4·18	·33	·30
3a.	9·12	4·16	102	8·88	4·18	·25	·24
4	9·02	4·72	41	8·56	4·65	·58	·46
5	9·02	3·28	52	8·76	3·25	·20	·26
5a.	9·02	3·28	79	8·53	3·34	·49	·49
5b.	9·02	3·28	93	8·35	3·27	·61	·67
6	9·13	4·49	57	8·88	4·35	·23	·25
8	9·52	4·06	74	9·25	3·92	·35	·27
9	9·27	4·07	77	8·91	4·06	·32	·36
10	9·11	4·19	91	8·24	4·14	·76	·87
11	9·34	4·07	91	9·01	4·01	·41	·33
12	8·42	3·70	91	8·14	3·69	·26	·28
13	8·83	5·32	91	8·56	5·20	·31	·27
14	9·20	3·98	91	8·80	3·83	·39	·40

MILKS to which approximately 10 per cent. of WATER has been ADDED.

1	8·14	3·44	14	7·96	3·41	·27	·18
(2)	8·14	3·44	30	7·81	3·40	·42	·33
3	8·24	2·79	38	7·88	2·78	·33	·36
4	8·24	2·79	38	7·73	2·76	·50	·51

SEPARATED MILKS.

	Total Solids.			Total Solids.			
(1)	9·66	·14	27	9·25		·22	·41
1a.	9·66	·14	36	9·34		·13	·32
1b.	9·66	·14	65	9·35		·26	·31
2	8·91	·09	28	8·62		·28	·29
2b.	8·91	·09	37	8·60		·20	·31
3	8·61	·13	30	8·33		·24	·28
3a.	8·61	·13	37	8·29		·28	·32
3b.	8·61	·13	91	7·93		·58	·68

SEPARATED MILKS to which approximately 10 per cent. of WATER has been ADDED.

1	8·18		21	7·86		·24	·32
1a.	8·18		1 year 22 days.	6·71		1·50	1·47
1b.	8·18		1 year 23 days.	6·64		1·56	1·54
1c.	8·18		1 year 36 days.	6·71		1·50	1·47
2	7·67		22	7·22		·33	·45
2a.	7·67		1 year 22 days.	6·24		1·49	1·43
3	7·76		73	7·11		·55	·65
4	7·80		185	6·22		1·59	1·58
4a.	7·80		188	6·19		1·69	1·61

LIST of ALLOWANCES made during the years 1894, 1895, and 1896, in Reference Milk Samples, on the basis of the Alcohol, Acetic Acid, and Ammonia found in the Milk. Per cent. by Weight of Solids.

·43	·20	·53	·36	·12	·77
·18	·24	·22	·15	·22	·09
·24	·49	·08	·23	·34	·57
·14	·45	·06	·71	·09	·12
·70	·10	·28	·12	·15	·16
·11	·47	·73	·09	·24	·32
·13	·19	·41	·24	·23	·10
·10	·16	·20	·84	·29	·15
·09	·10	·47	·25	·14	·12
·13	·10	·46	·51	·33	·38
·07	·21	·13	·38	·06	·28
·29	·36	·21	·18	·69	·45
·29	·35	·14	·22	·18	·14

APPENDIX XXX.

Handed in by Mr. JOHN SPEIR. (Q. 2721.)

EXPERIMENTS on the EFFECTS of FOOD on Milk and Butter carried out by Mr. SPEIR in 1895-7, and described in the Transactions of the Highland and Agricultural Society, 1896 and 1897.

I.—SUMMARY of RESULTS obtained during the last week of each period of Experiment.

1	2	3	4			5	6			7	8	9	10	11	12
——	Weeks in use.	Cows used.	Milk.			Per cent. solids not fats.	Fats.			Butter in lb. per 100 lb. of milk.	Per cent. of fat in the butter.	Per cent. of fat in the butter-milk.	Melting-point of the butter in degrees F.	Quality of the butter.	Increase or decrease of live-weight in lb. per cow.
			Lb. per cow first week.	Lb. per cow last week.	Above or below normal.		Per cent.	Per cent. above or below average.	Per cent. recovered in the butter.						
Pasture - - -	3	4	264·5	275·5	+ 7	9	3·52	—	90·2	3·77	—	1·25	90	1st	—
Vetches - - -	4	4	221·2	129·5	– 38·5	9·42	3·96	—	90·9	4·23	—	·4	92	2nd	—
Vetches and draff -	4	4	172·2	161	Average	9·11	3·70	—	84·7	3·68	—	·78	93	3rd	—
Maize - - -	4	4	154·7	130·4	– 9·4	9·25	3·74	—	88·7	3·90	—	1·2	92·5	1st	– 26
Beans - - - -	4	5	140	99·2	– 24	8·92	3·95	—	92·4	4·29	—	·2	90·5	1st	+ 15
Paisley-meal - -	5	5	109·4	80	– 15·8	9·06	4·05	—	90·5	4·48	82·5	1·1	87	3rd	+ 10
Oats - - - -	5	5	—	—	—	8·89	4·26	—	90·6	4·65	83	·35	90·5	1st	+ 25
Linseed-cake - -	5	6	—	—	—	9·52	4·02	—	94	4·58	84	·75	95	bad	– 8
Decorticated cotton-cake.	5	6	—	—	—	9·33	4·75	—	91·2	5·10	85	·10	103	1st	+ 47·8
Grains, bran - -	5	6	165·2	162·2	+ 7·5	9·38	3·80	+ 1·3	87	4·25	81·3	1·10	89·5	3rd	– 26
Mixture - - -	5	7	172·6	186·4	+ 17·8	9·35	3·60	– 4	93	4·20	80·1	·20	89	1st	– 8
Pasture - - -	5	8	203·4	221·7	+ 17·3	9·22	3·60	– 4	87·8	3·72	85	·67	90	1st	+ 23
Decorticated cotton-cake.	5	8	212·1	166·5	– 15·8	9·14	3·70	– 1·3	*88·5	3·76	85·3	·25	100	1st	+ 58·5
Do. and meat-meal -	5	8	176·4	148·6	– 8·3	9·73	4·15	+ 10·7	90·3	4·50	83·3	·80	95	3rd	+ 7
Cummins - - -	5	8	142·7	98·4	– 23·3	9·30	4·00	+ 6·6	88·2	4·19	84·5	·65	90	1st	+ 90·5
Sugar-meal, B. - -	5	8	127·7	111·0	– 2	9·33	3·55	– 5·4	86·3	3·68	82	·50	87	bad	– 15·7
Paisley-meal - -	3	8	117·1	118·5	+ 7·8	9·11	3·77	—	88·4	†4·07	80·3	·60	88	bad	+ 30
Grey peas - - -	5	8	122·0	131·2	+ 21·8	9·35	3·30	+ 1·3	93·1	3·94	84	·20	88·5	1st	+ 6·25
Do. and sugar-meal, A.	5	8	154·2	139·2	Average	9·35	3·70	– 1·3	86·0	3·83	83·5	·70	88	3rd	+ 11·5
Beans - - - -	5	8	167·2	130·2	– 14·8	9·25	3·75	Avg.	*86·0	3·57	85	·30	91	1st	– 5·1
Draff - - - -	5	8	158	180	+ 25·3	9·48	3	– 20	—	3·60	82·6	·60	91	bad	– 42
Do. - - - -	6	8	158	160·7	+ 15	9·13	2·6	– 30	—	—	82·1	·40	—	3rd	—

* Average of the fourth and fifth weeks. † The third week.

II.—TABLE showing the tendency of the percentage of fat in Milk to rise after each change, and then gradually to decline to near the normal.

Period.	1st Week Percentage of Fat.	2nd Week. Percentage of Fat.	3rd Week. Percentage of Fat.	4th Week. Percentage of Fat.	5th Week. Percentage of Fat.
6	4·11	4·43	4·38	4·26	4·05
7	4·24	4·49	4·46	4·5	4·26
8	—	4·85	4·23	4·08	4·02
9	4·60	5·20	4·85	5	4·75
10	3·9	3.65	4	3·8	3·75
11	3·85	3·50	3·55	3·35	3·60
13	4	4	4·25	4	3·7
14	3·97	4·1	4·25	4·1	4·15
15	4·3	4	3·7	4	4
16	4·1	3·8	3·7	3·7	3·5
18	3·7	3·7	3·6	3·6	3·8
19	3·7	3·8	3·7	3·6	3·7
20	3·7	3·7	3·7	3·8	3·75
—	48·17	53·22	52·37	51·79	51·03
Average.	4·01	4·09	4·03	3·98	3·92
—	Rise over 5th Week. ·09	Rise over 1st Week. ·08	Fall under 2nd Week. ·06	Fall under 3rd Week. ·05	Fall under 4th Week. ·06

APPENDIX No. XXXI.

Handed in by Mr. G. Cowan.

ANALYSES of Milk delivered to the Galloway Creamery in November 1899 to October 1900.

Dairy.	November				December				January				February				March				April		
	8	15	22	30	8	15	22	30	9	17	26	31	8	15	22	28	8	15	23	31	9	17	24
No. 1 - -	3·90	4·20	4·20	4·20	4·20	3·60	3·40	3·40	3·50	3·70	3·80	3·70	3·70	3·60	3·70	3·60	3·60	3·70	3·60	3·50	3·50	3·60	3·50
„ 2 - -	4·00	3·70	4·00	3·60	4·00	3·60	3·70	3·80	3·70	3·80	3·80	3·70	3·90	3·80	3·70	3·60	3·50	3·70	3·60	3·60	3·60	3·60	3·60
„ 3 - -	3·70	4·20	4·10	4·00	4·00	3·80	4·10	4·00	3·80	3·30	3·30	3·40	3·40	3·40	3·30	3·30	3·20	3·40	3·40	3·40	3·40	3·40	3·50
„ 4 - -	3·50	4·00	4·00	3·90	4·20	3·90	4·00	3·80	3·80	2·60	3·60	3·70	3·60	3·60	3·70	3·60	3·80	3·80	3·50	3·40	3·40	3·40	3·40
„ 5 - -	3·70	4·10	4·20	4·00	4·10	3·80	3·80	3·60	3·70	3·50	3·40	3·40	3·50	3·40	3·10	3·40	3·20	3·50	3·50	3·30	3·50	3·30	3·40
„ 6 - -	3·90	4·00	4·10	3·90	4·00	3·70	3·70	3·50	3·60	3·40	3·30	3·30	3·30	3·30	3·30	3·30	3·20	3·40	3·40	3·30	3·40	3·40	3·30
„ 7 - -	4·00	4·20	4·30	4·40	4·60	4·60	4·80	—	—	4·40	3·50	2·50	3·50	3·40	3·40	3·50	3·20	3·40	3·40	3·50	3·40	3·50	3·50
„ 8 - -	3·80	4·00	4·00	4·10	4·40	—	—	—	—	—	—	—	4·40	3·60	3·50	3·60	3·50	3·60	3·60	3·60	3·50	3·50	3·40
„ 9 - -	3·80	3·90	3·90	3·80	3·60	3·50	3·50	3·40	3·40	3·50	3·40	·40	3·40	3·50	3·50	3·50	3·70	3·70	3·70	3·60	3·60	3·60	3·70
„ 10 - -	3·30	3·60	3·70	4·10	3·50	3·40	3·30	3·30	3·30	3·40	3·30	3·30	3·30	3·40	3·30	3·30	3·20	3·40	3·30	3·30	3·30	3·40	3·60
„ 11 - -	3·40	4·00	4·10	4·60	4·10	4·00	3·70	3·80	3·90	3·50	3·50	3·40	3·50	3·50	3·40	3·40	3·30	3·50	3·50	3·40	3·40	3·50	3·40
„ 12 - -	4·00	4·20	4·20	4·30	4·20	4·00	4·20	4·00	4·00	3·90	3·70	3·70	3·70	3·70	3·70	3·70	3·50	3·70	3·60	3·60	3·50	3·40	3·40
„ 13 - -	3·50	3·70	3·80	3·90	—	—	—	3·70	3·80	3·50	3·60	3·60	3·60	3·50	3·50	3·60	3·40	3·50	3·40	3·40	3·30	3·30	3·30
„ 14 - -	3·50	3·60	3·90	4·00	4·20	4·20	4·30	4·10	—	—	3·90	3·[illegible]0	3·50	3·50	3·40	3·40	3·10	3·20	3·30	3·30	3·20	3·40	3·40
„ 15 - -	3·60	3·80	3·80	4·20	4·30	4·00	3·80	3·70	3·80	3·60	3·60	3·50	3·70	3·80	3·70	3·70	3·60	3·70	3·50	3·60	3·60	3·60	3·50
„ 16 - -	3·40	3·60	3·70	3·60	3·70	3·60	3·70	3·60	4·00	3·60	3·60	3·60	3·60	3·60	3·30	3·30	3·20	3·40	3·50	3·50	3·40	3·30	3·40
„ 17 - -	4·00	3·70	4·00	3·50	3·40	3·60	3·70	3·70	3·60	3·40	3·30	3·30	3·30	3·40	3·30	3·40	3·30	3·50	3·60	3·60	3·50	3·70	3·70
„ 18 - -	3·70	3·80	3·90	3·80	3·70	3·70	3·60	3·70	3·60	3·60	3·50	3·40	3·40	3·50	3·50	3·60	3·60	3·60	3·50	3·50	3·40	3·50	3·50
19 - -	3·40	3·30	3·40	4·00	4·00	3·90	3·70	3·50	3·40	3·40	3·40	3·40	3·40	3·30	3·30	3·30	3·20	3·40	3·40	3·30	3·30	3·30	3·30
„ 20 - -	3·90	4·20	4·00	3·60	3·50	3·60	3·60	3·50	3·40	3·40	3·30	3·30	3·30	3·40	3·40	3·40	3·30	3·50	3·40	3·30	3·40	3·40	3·30
„ 21 - -	3·40	3·40	3·80	3·50	3·50	3·50	3·50	3·50	3·70	3·60	3·40	3·40	3·20	3·40	3·40	3·60	3·50	3·50	3·40	3·30	3·30	3·40	3·40
„ 22 - -	3·50	4·00	3·80	3·70	3·60	3·60	3·70	3·80	3·80	3·70	3·70	3·80	3·60	3·50	3·10	3·20	3·30	3·40	3·40	3·30	3·40	3·50	3·40
„ 23 - -	4·00	3·70	—	—	4·00	3·50	3·60	3·50	3·70	4·00	3·70	3·20	3·60	3·50	3·40	3·20	2·40	3·20	3·20	3·30	3·20	3·40	3·40
„ 24 - -	3·80	3·90	4·00	4·00	3·50	3·60	—	—	—	—	—	—	—	—	3·60	3·40	3·30	3·40	3·40	3·50	3·40	3·40	3·10
„ 25 - -	—	—	—	3·00	3·70	3·60	3·40	3·50	3·60	3·40	3·30	3·40	3·40	3·40	3·40	3·30	3·40	3·40	3·40	3·40	3·40	3·50	3·50
„ 26 - -	—	—	—	3·20	3·40	3·40	3·40	3·30	3·30	3·50	3·30	3·30	3·20	3·40	3·30	3·30	3·40	3·50	3·50	3·40	3·40	3·40	3·40
„ 27 - -	—	—	—	—	3·60	3·60	3·60	3·50	3·50	3·60	3·60	3·60	—	3·60	3·50	3·30	3·40	3·40	3·30	3·20	3·30	3·20	3·30
„ 28 - -	—	—	—	—	3·00	3·40	3·40	3·50	3·70	4·00	4·00	3·50	3·30	3·50	3·50	3·40	3·40	3·50	3·40	3·40	3·40	3·40	3·40
„ 29 - -	—	—	—	—	—	—	—	—	—	3·80	3·80	3·60	3·50	3·70	3·70	3·50	3·30	3·50	3·50	3·50	3·45	—	—
„ 30 - -	—	—	—	—	—	—	—	—	—	—	3·40	3·50	3·60	3·50	3·50	3·50	3·50	3·50	3·50	3·50	3·50	3·50	3·40
Averages -	3·79				3·72				3·55				3·47				3·44				3·46		

APPENDIX No. XXXI—*continued*.

Dairy.	May				June				July				August				September				October			
	9	15	24	31	7	15	22	29	7	16	23	31	8	16	24	31	8	17	24	30	9	16	23	30
No. 1 -	3·40	3·30	3·30	3·30	3·30	3·40	3·30	3·40	3·40	3·50	3·50	3·50	3·60	3·60	3·60	3·70	3·70	3·80	3·80	3·80	3·90	3·90	4·00	3·80
„ 2 -	3·40	3·30	3·40	3·40	3·40	3·40	3·30	3·40	3·40	3·40	3·40	3·50	3·50	3·60	3·60	3·70	3·70	3·70	3·80	3·80	4·00	4·00	4·00	4·00
„ 3 -	3·50	3·40	3·30	3·30	3·40	3·40	3·20	3·30	3·30	3·40	3·30	3·60	3·60	3·60	3·50	3·70	3·70	3·70	3·70	3·80	3·90	3·90	4·00	4·00
„ 4 -	3·40	3·40	3·30	3·40	3·40	3·40	3·30	3·40	3·40	3·40	3·40	3·50	3·50	3·60	3·60	3·70	3·70	3·80	3·90	3·90	3·90	4·00	4·00	4·20
„ 5 -	3·30	3·40	3·30	3·40	3·40	3·40	3·30	3·40	3·40	3·40	3·40	3·50	3·50	3·60	3·60	3·60	3·70	3·30	3·70	3·70	3·70	3·80	3·80	3·90
„ 6 -	3·40	3·30	3·30	3·40	3·40	3·40	3·30	3·40	3·40	3·50	3·50	3·40	3·50	3·60	3·60	3·70	3·70	3·70	3·70	3·80	3·70	3·80	3·80	3·80
„ 7 -	3·30	3·30	3·30	3·30	3·30	3·30	3·40	3·40	3·40	3·50	3·40	3·50	3·50	3·50	3·60	3·70	3·60	3·80	3·70	3·90	3·80	3·90	3·90	3·00
„ 8 -	3·70	3·60	3·60	3·60	3·50	3·60	3·60	3·60	3·50	3·50	3·60	3·60	3·70	3·80	3·80	3·80	3·80	3·90	4·00	4·00	4·00	4·00	4·00	4·10
„ 9 -	3·40	3·40	3·30	3·30	3·30	3·30	3·40	3·40	3·40	3·40	3·40	3·50	3·50	3·60	3·60	3·20	3·80	3·80	3·80	3·80	3·80	4·00	3·90	4·00
„ 10 -	3·40	3·50	3·40	3·40	3·30	3·40	3·40	3·50	3·40	3·40	3·50	3·60	3·60	3·50	3·60	4·00	3·90	4·00	3·90	4·00	4·00	4·10	4·00	4·10
„ 11 -	3·40	3·40	3·30	3·40	* 3·30	3·40	3·40	3·40	3·40	3·40	3·40	3·50	3·60	3·60	3·60	3·70	4·00	4·00	4·10	4·10	4·00	4·00	4·10	4·10
„ 12 -	3·50	3·40	3·40	3·40	3·40	3·50	3·40	3·40	3·40	3·40	3·50	3·60	3·60	3·70	3·60	3·60	3·70	3·70	3·80	3·90	3·80	4·00	3·80	4·00
„ 13 -	3·50	3·50	3·30	3·40	3·30	3·40	3·30	3·30	3·50	3·50	3·40	3·60	3·60	3·60	3·70	3·70	3·80	3·90	4·00	4·00	4·10	4·20	4·20	4·20
„ 14 -	3·40	3·40	3·30	3·30	3·40	3·50	3·50	3·50	3·40	3·50	3·40	3·60	3·60	3·60	3·70	3·70	3·60	3·70	3·60	3·90	4·00	4·00	4·00	4·10
„ 15 -	3·70	3·60	3·50	3·60	3·50	3·60	3·50	3·50	3·50	3·60	3·60	3·70	3·70	3·70	3·80	3·80	3·80	3·80	4·00	4·00	4·00	4·00	4·10	4·30
„ 16 -	3·40	3·40	3·30	3·30	3·30	3·30	3·30	3·40	3·40	3·50	3·50	3·60	3·60	3·60	3·60	3·70	3·70	3·70	3·80	3·90	4·00	4·00	[illegible]	4·00
„ 17 -	3·30	3·30	3·30	3·40	3·40	3·40	3·30	3·30	3·50	3·50	3·50	3·50	3·60	3·60	3·60	3·70	3·80	3·70	4·00	4·00	3·90	3·90	3·80	3·80
„ 18 -	3·40	3·40	3·40	3·40	3·40	3·40	3·30	3·40	3·40	3·50	3·50	3·60	3·60	3·60	3·60	3·70	3·70	3·80	3·80	[illegible]	3·90	3·90	4·00	4·00
„ 19 -	3·40	3·30	3·30	3·40	3·40	3·30	3·40	3·40	3·50	3·40	3·50	3·60	3·50	3·40	3·60	3·70	3·70	3·80	3·80	3·80	3·70	3·80	3·80	3·90
„ 20 -	3·40	3·30	3·30	3·30	3·30	3·40	3·30	3·30	3·50	3·40	3·40	3·50	3·50	3·50	3·60	3·70	3·60	3·60	3·70	3·70	3·80	3·80	3·80	3·60
„ 21 -	3·40	3·40	3·40	3·40	3·40	3·40	3·40	3·40	3·40	3·50	3·60	3·50	3·60	3·60	3·70	3·60	3·70	3·70	3·80	4·00	4·00	4·00	4·10	4·20
„ 22 -	3·30	3·50	3·40	3·50	3·30	3·40	3·40	3·40	3·40	3·40	3·40	3·50	3·50	3·50	3·50	3·60	3·60	3 60	3·70	3·80	3·80	4·00	4·00	4·00
„ 23 -	3·50	3·40	3·30	3·50	3·40	3·30	3·40	3·40	3·50	3·50	3·60	3·60	3·60	3·70	3·70	3·70	3·80	3·90	3·90	4·00	4·00	4·00	4·00	4·00
„ 24 -	3·40	3·30	3·40	3·40	3·30	3·50	3·60	3·50	3·40	3·40	3·50	3·50	3·50	3·50	3·50	3·50	3·50	3·70	3·60	3·70	3·60	3·50	3·70	3·70
„ 25 -	3·50	3·40	3·40	3·40	3·40	3·40	3·30	3·50	3·50	3·50	3·60	3·60	3·70	3·60	3·70	3·60	3·80	3·80	3·90	3·90	4·00	4·20	4·10	—
„ 26 -	3·50	3·50	3·40	3·40	3·40	3·40	3·40	3·40	3·50	3·40	3·50	3·60	3·70	3·60	7·50	3·90	3·70	3·80	3·90	4·00	3·90	4·00	4·00	5·00
„ 27 -	3·40	3·40	3·60	3·60	3·50	3·50	3·50	3·50	3·50	3·60	3·60	3·70	3·70	3·70	3·70	3·80	3·90	4·00	4·00	4·10	4·10	4·10	4·20	4·20
„ 28 -	3·30	3·30	3·30	3·40	3·40	3·40	3·30	3·40	3·40	3·40	3·40	3·50	3·50	1·60	3·60	3·60	3·70	3·80	4·00	3·90	3·90	4·00	3·80	4·00
„ 29 -	3·40	3·40	3·40	3·40	3·30	3·40	3·40	3·40	3·40	3·40	3·40	3·50	3·50	3·50	3·50	3·60	3·70	3·80	3·80	3·80	3·90	3·80	4·00	3·90
„ 30 -	3·30	3·30	3·30	3·40	3·40	3·40	3·40	3·40	3·40	3·50	3·40	3·50	3·50	3·50	3·50	3·80	3·60	3·70	3·70	3·80	3·80	3·90	4·00	4·10
„ 31 -	3·70	3·60	3·50	3·50	3·40	3·50	3·40	3·40	3·50	3·60	3·70	3·70	3·70	3·70	3·80	3·90	3·90	4·00	4·00	4·20	4·00	—	—	—
„ 32 -	3·50	3·50	3·60	3·50	3·40	3·50	3·50	3·50	3·50	3·60	3·50	3·50	3·50	3·50	3·50	3·40	3·60	3·80	3·70	3·80	3·80	3·90	3·90	4·10
„ 33 -	3·50	3·40	3·30	3·40	3·40	3·50	3·40	3·50	3·40	3·50	3·50	3·50	3·50	3·60	3·60	3·70	3·80	3·30	3·80	3·80	3·80	3·80	3·90	4·00
„ 34 -	3·30	3·30	3·30	3·30	3·30	3·30	3·20	3·30	3·40	3·40	3·40	3·50	3·50	3·60	3·50	3·50	3·40	3·40	3·70	3·70	3·80	3·90	3·90	3·00
Averages	3·40				3·40				3·48				3·61				3·80				3·93			

APPENDIX No. XXXII.

Handed in by Mr. Barham.

Results of Analyses of Milk collected by the Analysts' Inspector for Mr. Knight, of Stepney, immediately upon its arrival at the Railway Station.

Analysed by Messrs. Redwood and De Hailes.

Date.	Mark.		Specific Gravity.	Total Solids.	Fat.	Solids not Fat.	Analysts' Report.
1900:				*Per Cent.*	*Per Cent.*	*Per Cent.*	
22 May -	J. Christy -	- 2017	1032·5	12·45	3·30	9·15	Good milk.
22 „ -	Stokes - -	- 2040	1032·5	12·10	3·00	9·10	Not adulterated.
22 „ -	N. Gaward -	- 1100	1031·5	11·70	2·90	8·80	Poor milk.
22 „ -	H. Miles -	- 1037	1032·5	11·72	2·80	8·92	6 per cent. deficient in fat.
22 „ -	Ollington -	- 870	1031·5	11·47	2·60	8·87	13 per cent. deficient in fat.
22 „ -	W. L. Gorwyn	- 2033	1032·0	11·20	2·40	8·80	20 per cent. deficient in fat.
22 „ -	Gorwyn -	- 1077	1031·5	11·78	3·00	8·78	Poor milk.
22 „ -	Vicery - -	- 17	1032·0	12·04	3·00	9·04	Not adulterated.
22 „ -	Vicery - -	- 2013	1032·0	11·95	2·90	9·05	- - ditto.
22 „ -	R. Neill -	- 4	1032·5	12·09	3·00	9·09	- - ditto.
22 „ -	R. Neill -	- 23	1032·0	12·14	3·20	8·94	- - ditto.
22 „ -	Sexton - -	- 882	1033·0	12·88	3·50	9·38	Good milk.
22 „ -	Sexton - -	- 416	1033·0	12·95	3·60	9·35	- ditto.
22 „ -	J. H. Fielding	- 22	1032·0	12·06	3·10	8·96	Not adulterated
22 „ -	J. H. Fielding	- 21	1032·0	11·95	3·00	8·95	- ditto.
22 „ -	H. Miles -	- 1072	1032·0	12·07	3·10	8·97	- - ditto.
22 „ -	H. Miles -	- 1007	1032·0	12·90	3·90	9·00	Good rich milk.
1 June -	Avila - -	- 31	1032·5	12·19	3·10	9·09	Not adulterated.
1 „ -	Avila - -	- 993	1032·0	11·77	2·90	8·87	Poor milk.
1 „ -	Avila - -	- 1005	1032·5	12·39	3·30	9·09	Not adulterated.
1 „ -	Craig - -	- 12	1032·5	12·65	3·50	9·15	Good milk.
1 „ -	Craig - -	- 5	1032·0	12·15	3·20	8·95	Not adulterated.
1 „ -	Craig - -	- 2061	1033·0	12·32	3·10	9·22	- - ditto.
1 „ -	R. Craig -	- 69	1033·5	12·36	3·00	9·36	- - ditto.
1 „ -	E. B. Buxton	- 2054	1032·5	12·60	3·50	9·10	Good rich milk.
1 „ -	E. B. Buxton	- 1076	1033·5	12·74	3·20	9·54	Good milk.
1 „ -	E. B. Buxton	- 2052	1033·0	11·67	2·50	9·17	16 per cent. deficient in fat.
1 „ -	Ollington -	- 1075	1032·0	11·63	2·90	8·73	Very poor milk.
1 „ -	Gorwyn -	- 746	1031·5	11·80	3·00	8·80	Not adulterated, but poor
1 „ -	Baird - -	- 2511	1032·5	12·07	3·10	8·97	Not adulterated.
1 „ -	Fielding -	- 28	1032·0	11·59	2·70	8·89	10 per cent. deficient in fat.
1 „ -	Fielding -	- 23	1032·0	11·90	3·00	8·90	Not adulterated
1 „ -	Lee - -	- 6	1034·0	12·02	2·50	9·52	16 per cent. deficient in fat.
1 „ -	Gorwyn -	- 1077	1031·0	11·70	3·00	8·70	Very poor milk.
1 „ -	F. Buxton -	- 1079	1030·0	11·73	3·00	8·73	Not adulterated, but poor milk.
1 „ -	F. Buxton -	- 2043	1031·0	10·85	2·10	8·75	30 per cent. deficient in fat.
1 „ -	Avila - -	- 994	1032·0	11·72	2·80	8·92	6 per cent. deficient in fat.
1 „ -	Avila - -	- 1081	1032·0	11·82	2·80	9·02	per cent. deficient in fat.

Mr. Knight states that he had no reason to suspect that any of the milks had been tampered with by the farmers, who are respectable and substantial men. The milks lowest in butter fat on the dates given above yielded as much as 4 per cent. of butter fat before the cows were turned out to grass.

APPENDIX No. XXXIII.

Handed in by the CHAIRMAN.

REMARKS as to Analysis of Milk from Cows kept on Mr. Adeane's farms at Babraham, Cambridge.

The milk is sold from our own carts (not supplied wholesale to other dairymen). We have great competition, and our aim is to supply the best milk retailed in the district, and yet we find that at times the cows fall below the present Somerset House Standard.

I am satisfied that milk hardly ever shows (for some reason that I cannot explain) so high an analysis after it has been in the churn or can some hours as when first poured in.

The last experiment to prove this is given, Nos. 19, 20, and 21, although there is not so great a difference as there is sometimes.

I am sure that in exceptionally dry seasons, when pastures and all growing crops are parched up, and at other times from various causes, it is almost impossible to keep cows up to the present Somerset House Standard.

I do not consider that I have studied the analysis of milk for enough years, or from cows kept under a sufficient variety of circumstances to venture to express an opinion as to what standard should be fixed, but I am certain that under the present one dairymen whose cows are well fed and are in perfectly healthy and good condition are liable to be fined for adulteration of milk, although they may be innocent; on the other hand, in early summer when grass is at its best, the present standard is quite low enough, and, I believe, I am correct in stating that milksellers wishing to could then add a large percentage of water without an analyst being able to detect adulteration.

Certainly, whatever standard may be fixed, every cowkeeper, magistrate, and police officer should have due notice of same; as at present, I believe, a very large percentage of those interested in the law regarding the sale of milk are quite ignorant as to what standard the public analyst for their particular district adopts.

The fee to milk-sellers for analysis of milk should be greatly reduced, small tenant farmers cannot afford to pay 10*s*. for each analysis.

F. N. WEBB, P.A.S.I.,
Babraham, Cambridge.

17th March 1900.

ANALYSIS of SAMPLES of BABRAHAM DAIRY MILK, &c.

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
	1898, October.	1898, October.	1899, 29th August.	*1899, 29th August.*	1899, 30th August.	*1899, 14th September.*	1899, 14th September.	1899, 17th September.	1899, 16th September.	*1899, 16th September.*
	Morning's milk taken from a cow at the London Dairy Show. This cow was entered in the Milking Competition where quality and quantity of milk are both considered in awarding the prizes.	Afternoon's milk from the same cow on the same day at the Dairy Show.	Morning's milk taken from the Cambridge cart before it left the yard, immediately after milking at Babraham.	*Morning's milk taken from the Sawston cart before it left the yard, immediately after milking at Babraham.*	Morning's milk taken from the Cambridge cart at Cambridge.	*Morning's milk taken from the Sawston cart.*	Afternoon's milk taken from Cambridge cart at Shelford.	Morning's milk taken from Cambridge cart at Shelford.	Morning's milk taken from the cows (that are milked for Cambridge cart), taken by police inspector, at my request, direct from the cows.	*Morning's milk taken from the cows (that are milked for Sawston cart), taken by police inspector, at my request, direct from the cows.*
Total Solids - -	10·30	11·72	10·46	*11·44*	10·72	*11·20*	12·50	12·54	12·80	*11·98*
Solids (not Fat) -	8·18	8·11	7·68	*8·18*	7·89	*7·98*	8·56	9·40	9·70	*8·62*
Fat - - - -	2·12	3·61	2·78	*3·36*	2·83	*3·22*	3·94	3·14	3·10	*3·36*
Ash - - - -	—	—	·60	*·60*	·60	*·76*	·76	·74	·78	*·74*
Analyst's Remarks -	—	—	Adulterated with not less than 10 per cent. of added water.	*Genuine milk, poor quality.*	Adulterated with not less than 7 per cent. of added water.	*Genuine milk, very poor quality.*	Genuine milk of good quality.	Genuine milk, fairly good quality.	Genuine milk.	*Genuine milk.*
F. N. Webb's Remarks.	Nos. 1 and 2.—The above analysis is copied from The British Dairy Farmers' Association Report of the show, and is a remarkable example of the suddenness with which a cow's milk will alter in quality.		Nos. 3 to 21 are all samples of milk taken from cows in the Babraham herd; all the cows in milk are kept in the same set of buildings, attended and milked by the same men, and fed alike. The analyses refer to milk sold on a walk in Cambridge and adjoining villages with the exception of those in *italics*, which refer to milk sold in Sawston and adjoining villages. The heaviest milking (generally "fresh-calved" cows) are set apart for the Cambridge round, and, although living under similar conditions, they never yield such good milk as the others. The Cambridge cart leaves about 5.30 a.m., and the Sawston cart about 6.30 to 7 a.m.							
			Cows out at grass and having in addition— 10 lbs. linseed cake, 3 lbs. cotton cake, 26 lbs. maize meal, each per week.			Cows out at grass and having in addition— 17 lbs. linseed cake, 26 lbs. maize meal, each per week.				

ANALYSIS of SAMPLES of BABRAHAM DAIRY MILK, &c.

	11. *1899,* *8th December.* *Morning's milk taken from the Sawston cart before it left the yard, immediately after milking at Babraham.*	12. *1899,* *8th December.* *Morning's milk taken from the same can while delivery was taking place at Sawston.*	13. 1899, 9th December. Morning's milk taken from the Cambridge cart before it left the yard, immediately after milking at Babraham.	14. 1899, 9th December. Morning's milk taken from the same can while delivery was taking place at Cambridge.	15. 1900, 3rd January. Morning's milk taken from the Cambridge cart before it left the yard, &c., &c.	16. 1900, 3rd January. Morning's milk taken from the same can while delivery was taking place at Cambridge.	17. 1900, 1st February. Morning's milk taken from the Cambridge cart before it left the yard, &c., &c.	18. 1900, 1st February. Morning's milk taken from the same can while delivery was taking place at Cambridge.	19. 1900, 26th February. Morning's milk taken from the Cambridge cart before it left the yard, &c., &c.	20. 1900, 26th February. Morning's milk taken from same can as No. 19 when about half delivered.	21. 1900, 26th February. Morning's milk taken from same can as 19 and 20, when nearly all delivered.
Total solids - -	*12·20*	*12·24*	11·70	11·16	11·94	11·28	11·50	11·12	11·60	11·52	11·50
Solids (not fat) -	*8·81*	*9·11*	9·21	8·84	9·38	9·15	8·72	8·45	8·67	8·61	8·59
Fat - - - -	*3·39*	*3·13*	2·49	2·32	2·56	2·13	2·78	2·67	2·93	2·91	2·91
Ash - - - -	*·78*	*·76*	·76	·78	·76	·76	·74	·72	·72	·70	·72
Analyst's remarks	*Genuine milk, average quality.*	*Fair quality.*	Poor in fat.	Very poor in fat	Fat is low, and in comparison with the Somerset House limit (2·75 per cent.), shows a deficiency of 7 per cent.	Fat is very low, and in comparison with the Somerset House limit (2·75 per cent.), shows a deficiency of 23 per cent.	Genuine, but not high quality.	Deficient in fat to the extent of 3 per cent., compared with Somerset House limit.			
F. N. Webb's remarks.	Roots and chaff *ad lib.* 14 lbs. linseed cake - - - - - } each 21 lbs. gluten - - - - - } per 37 lbs. maize - - - - - } week.				Cow's food, mangolds, chaff *ad lib.*, grains, hay. 39 lbs. cracked and steamed maize - } each 8 lbs. bean meal - } per 14 lbs. linseed cake } week.		Cows having mangolds, oat straw, chaff *ad lib.*, grains, hay. 19 lbs. linseed cake } each 13 lbs. cotton cake - } per 13 lbs. bean meal - } week.		Farm steward in the cart with milkman all the time, and took the samples. Cows having mangolds, oat straw, chaff *ad lib.*, grains, hay. 40 lbs. of crushed oats - - - } each 13 „ bean meal - - - - } per 13 „ cotton cake - - - - } week.		

APPENDIX No. XXXIV.

Handed in by the CHAIRMAN.

Standards for Milk in certain Foreign Countries.

A.—From the Departmental Committee to the Under Secretary of State for Foreign Affairs.

4, Whitehall Place, S.W.
8 March 1900.

Sir,

I AM directed by the Departmental Committee appointed by the Board of Agriculture, under Section 4 of the Sale of Food and Drugs Act, 1899, to ask you to be so good as to move the Marquess of Salisbury to obtain for the purpose of their inquiry, through Her Majesty's Representatives in France, Belgium, Holland, Sweden, Denmark and Germany, the latest available information respecting the standards (if any) of purity for milk, condensed milk or cream, which are authorised by law, or officially recognised for administrative purposes in those countries.

The Committee would be further obliged if, in cases where such standards exist, they might be supplied with information as to the effect which they have, or are reported to have, on the milk or cream supply of the countries or districts in which they are enforced.

I have the honour to be,
Sir,
Your obedient servant,
R. HENRY REW,
Secretary to the Departmental Committee
on Milk Standards.

To the Under Secretary of State,
Foreign Office, S.W.

B.—From the Hon. Sir F. R. Plunkett, G.C.M.G., to the Secretary of State for Foreign Affairs.

(No. 34—Commercial).

My Lord, Brussels, 16 April 1900.

WITH reference to your Lordship's despatch, No. 20, of the 14th ultimo, I have the honour to transmit to your Lordship, herewith, copy of a Note received from Monsieur de Favereau respecting the regulations controlling the sale of milk in Belgium, and to the methods of analysis adopted.

I have, &c.,
(Signed) F. PLUNKETT.

The Marquess of Salisbury, K.G.,
&c., &c., &c.

(B 1.—Enclosure).

Bruxelles, 14 Avril 1900.

Monsieur le Ministre,

EN vue de satisfaire au désir que le Légation de Sa Majesté Britannique a bien voulu m'exprimer sous la date du 16 Mars dernier, j'ai l'honneur de mettre à la disposition de Votre Excellence plusieurs exemplaires du règlement relatif au commerce du lait en Belgique, ainsi qu'une brochure qui contient le texte de la convention intervenue entre les analystes belges en vue de l'unification des méthodes de vérification courante du lait.

Les documents ci-joints m'ont été transmis par le Ministre de l'Agriculture à qui j'avais eu soin de donner connaissance de la lettre de la Légation.

Veuillez, &c.,
(Signed) P. DE FAVEREAU.

Sir F. Plunkett, G.C.M.G.,
&c., &c., &c.

(B 2.—Enclosure).

TRANSLATION from "Bulletin du Service de Surveillance de la Fabrication et du Commerce des Denrées Alimentaires." November, 1895, pp. 341–49.

PERFECTION AND UNIFICATION OF THE METHODS OF ANALYSIS.

The Minister has decided that, in execution of Art. 8 of the Royal Decree of 22nd June 1891, concerning the organisation and working of the Analytical Service, meetings of the staff of the said service shall be held henceforth, at least three times a year (on the second Mondays of the months of March, July, and November), with the object of discussing the perfection and unification of methods.

MILK.—Agreement between the Analysts.

In response to the invitation of the Minister, the Analysts of the Service* met to the number of 27, on the 11th November 1895, at the Ministry of Agriculture and Public Works, with a view to the unification of the methods of current verification of milk.

The Minister had beforehand communicated to them a draft agreement, based upon the proposals previously formulated by a certain number of them,† and by the Superior Council of Public Hygiene, as well as upon the results of the analyses made up to the most recent date in execution of the law.

After discussion they adopted the general method, as well as the modes of carrying it out, hereafter described.

Some accessory questions were postponed for further study and subsequent discussion.

METHOD Adopted for the Detection of Adulteration of Milk by Abstraction of Cream, Watering, or addition of Foreign Matter.

General Procedure.

The general procedure to be followed is that shown as under :

Note first the particulars entered in the inspector's application form, as regards the district whence the milk is derived, the number of cows milked, the breeds of these cows, their mode of feeding and other circumstances which might influence the composition of the milk.

As preliminary tests, observe the organoleptic features (colour, degree of opacity, odour, taste), make a microscopical examination, and determine the density.

Then proceed to the determination of the solids, the butter and the lactose (this last only to be performed on fresh milk).

The results of these operations will often permit of a conclusion being drawn as to adulteration by abstraction of cream or watering.

If doubt remains, particularly as regards watering, determine the ash and the casein.

If the totality of the results obtained does not permit of a categorical statement that the milk does or does not satisfy the requirements of the law and regulations, and if it is a question of milk from cows isolated or under disadvantageous conditions, the analyst should immediately request the inspector to procure, if possible, a sample at the cowshed itself, to be used for comparison. The analysis of this genuine sample will allow of a definite conclusion being drawn. Failing this means, one must be satisfied with declaring the milk to be suspicious or doubtful, or at the least abnormal.

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* Except those whose exclusive speciality is the analysis of fermented liquors and bacteriological analyses.

† *See* Bulletin, October, 1893, and April and August, 1895.

In the event of solids or ash content, or the examination of the organoleptic and microscopic characters, giving cause for suspecting the addition of foreign organic or mineral matter, proceed to test for these foreign substances.

After having devoted his attention generally to detecting the defects treated of above, which are the most frequent, the analyst will proceed to any special test which the inspector may have asked him to undertake, particularly the detection of salicylic acid or other preserving agents.

Points to be borne in mind ; Conclusions.

The considerations on which the analyst should rely in interpreting the results of his researches, and in formulating his conclusions, are the following :

Normal milk.—A normal milk, full and pure, shows a composition comprised within the following limits :—

—	Minima.	Averages.	Maxima.
Solids, grammes per 100 c.c.	11·50	13·00	15·00
Fat ,, ,,	2·80	3·50	4·50
Lactose ,, ,,	4·50	5·00	5·50
Casein ,, ,,	3·00	3·80	5·00
Ash ,, ,,	0·60	0·70	0·80
Non-fatty solids, 8·70 at least.			

The density varies from 1·028 or 1·029 to 1·033 or 1·034.

It is even recognised that in certain districts of the country, the milk furnished exclusively, or in major part, by cows under normal conditions of milk production, persistently show a content in solids, fat, etc., higher than those indicated above. The same applies to mixed milk from a large number of cows.

On the other hand it must be understood that all the minima contents in fat, lactose, casein, and ash, could not collectively occur in any one normal milk.

Abnormal milk.—Milk derived exclusively or principally from cows under specially disadvantageous conditions, may, without having been subjected to any fraudulent manipulation after it has been drawn, present a composition, in certain of its constituent elements, inferior to the above recorded minima ; this is abnormal milk.

Apart from these particular cases of abnormal milk, a milk of which the contents are inferior to the above recorded minima will be declared to have had cream abstracted, been watered, or both had cream abstracted and been watered, or at the least doubtful and suspected of having been subjected to one or other of these manipulations.

Milk deprived of cream.—A milk with a fat content of 2·50 to 2·80 gr. per 100 c.c., with a relatively high density, will be considered doubtful or suspected.

A milk with a high density, and having a fat content of less than 2·50 gr. per 100 c.c., will be declared adulterated by abstraction of cream.

The total-solids content of milk deprived of cream is low, on account of the abstraction of fat and a certain portion of the casein ; the non-fatty-solids content may also be relatively low on account of the abstraction of a part of the casein by removal of cream.

The lactose content is normal.

Watered milk.—A milk of which the various contents are in proportions below the above-mentioned minima, and of which the solids are 11 to 11·5 gr. per 100 c.c., will be considered as doubtful or suspected of having been watered.

A milk, of which the various contents are in proportions sensibly inferior to the minima, of which the total-solids content is below 11 gr. per 100 c.c., the non-fatty-solids content below 8·2 gr. per 100 c.c., and the density below 1·027, will be declared watered.

Milk deprived of cream and watered.—In cases of abstraction of cream, a milk of which not only the fat content, but also the lactose, casein, and ash contents are inferior to the minima, and of which the non-fatty-solids content is between 8 and 8·7 gr. per 100 c.c., will also be considered as suspected of having been watered.

A milk of which the various contents are found in proportions sensibly below the minima, and of which the non-fatty content is inferior to 8·0 gr. per c.c., will be declared to have had cream abstracted and been watered.*

Milk to which foreign matter has been added.—If the proportion of solids is sensibly superior to the sum of the contents in the constituents which normally compose it (fat, lactose, casein, ash), the milk will be suspected to contain foreign matter (organic or mineral).

A milk containing a weight of ash amounting to more than 0·8 gr. per 100 c.c. will be suspected of having been adulterated by the addition of mineral matter.

This foreign matter should be sought.

The analyst will take account, if need be, of any addition which the inspector may have made to the milk, with a view to preserving it, of antiseptics such as chloroform,† formic aldehyde (formal, formalin), bichromate of potash, salicylic acid. But it is preferable that the inspector should refrain from adding any antiseptic.

In the case of curdled milk, the operations being performed preferably upon weighed quantities of milk, the results of the analysis will be expressed in grammes per 100 gr.

In the interpretation of the results of the various analytical operations, it is important not to lose sight of the observations and exceptions above noted, on the one hand as regards the mixed milk of a large number of cows and the milk of cows under good conditions, and on the other hand as regards the milk of cows isolated or under particularly disadvantageous conditions.

A milk will only be considered suspicious or doubtful in the absence of all means of recognising with certainty whether it is adulterated or simply abnormal.

It is scarcely necessary to recall that the estimate of the amount of watering or abstraction of cream can never be obtained otherwise than approximately, in round numbers, accompanied by the words "about," or "at least," according as this estimate refers to normal average or minima contents.

As a general rule abstraction of cream is not definitely shown in a proportion less than 10 per cent. of the quantity of fat, nor watering in a proportion less than 10 per cent. of the volume of milk.

OPERATIVE PROCESSES.

Determination of the Density.

This is performed with the densimeter, by means of the picnometer, or preferably by Westphal's balance.

Determination of the Solids.

10 c.c. of milk are slowly evaporated in the water-bath, then dried in a Gay-Lussac's oven at a temperature of 95–100° C., until the weight is constant.

The question of the temperature to be adopted for desiccation remains to be studied.

Determination of the Fatty Matter.

(1.) By extraction of the residue from evaporation. To 25 or 50 c.c., after trituration in the mortar in the case of curdled milk, add pumice stone in powder or very pure wood charcoal, and evaporate to dryness. The pulverised residue is submitted to extraction by Soxhlet's process, the ethereal solution evaporated, dried at 100°, and weighed.

In the case of curdled milk, to avoid the too high results due to the lactic acid, which dissolved by the ether, does not evaporate in the water-bath, dilute the milk with 3 volumes of water, add a little acid or rennet, filter, wash until the acidity disappears, dry the filter and its contents on sand, and extract the residue with ether.

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* The limit of the non-fatty-solids content has here been lowered to 8 gr. per 100 c.c., so as to take into account the withdrawal of a portion of the casein with the fat in abstracting cream.

† See particularly, as regards chloroform, the Bulletin f June, 1895, p. 173.

When the milk is quite fresh, about 10 c.c. of the milk are absorbed on special paper, which is then dried and extracted.

(2.) By the ether or petroleum-spirit process (*see* Bulletin, October 1894, p. 401).

(3.) By Soxhlet's areometrical method.

(4.) By means of Gerber's acido-butyrometer.

Determination of the Lactose.

(1.) by means of Fehling's solution.

Add a few drops of acetic acid to the milk to coagulate the casein and fat; heat to about 45°, make up to a given volume and filter; in the filtrate determine the lactose by Fehling's solution.

(2.) By means of the polarimeter.

Determination of the Casein.

(1.) By Kjeldahl's method.

20 to 50 c.c. are evaporated in a Hofmeister beaker of thin glass. After desiccation, the beaker with its contents is pulverised, and the whole introduced into a small glass flask with a long neck. Sulphuric acid containing phosphoric acid is added, and the determination of the nitrogen is continued by Kjeldahl's method.

The figure representing the nitrogen content is multiplied by 6·25.

The question whether there is reason to modify this coefficient, as regards the casein of milk, is held over.

(2.) By coagulation.

Precipitate 20 c.c. of milk, to which have been added 80 c.c of water, with a few drops of acetic acid; filter on a tared filter, wash, dry, extract with ether; dry, weigh; calcine the residue; subtract the weight of the ash.

All the casein is not precipitated by this process, there remains albuminoid matter in solution in the filtrate and washing water; precipitate these by prolonged ebullition, filter on a tared filter, wash with boiling water, dry at 100°, and weigh.

Determination of the Ash.

The dry solids are incinerated, taking care not to heat too much.

Foreign Organic Substances.

Microscopical examination is made.

The milk is tested with solution of iodine.

Bicarbonate of Soda.

This is done by alkalimetrical titration of the aqueous solution of the ash, by means of deci-normal sulphuric acid.

The ash, or simply the evaporated serum, effervesces with acids in the presence of bicarbonate.

Borax.

The examination for borax is by the colour imparted to a flame, and the reaction with turmeric.

Salicylic Acid.

The milk freed from casein by acetic acid is used for the test.

QUESTIONS REMAINING TO BE STUDIED.

(1.) Utility and value of the test for nitrates for the detection of watering.—Operative method (*See* Bulletin for July, 1895, p. 212).

(2.) Temperature to be adopted for the desiccation of the solids.

(3). Coefficient to be adopted for the application of Kjeldahl's method to the determination of the casein.

(4). Determination of watering of milk deprived of cream or curdled by examination of the whey by Lescœur's method.

Tests to be made.—Determination of the density of the whey; determination of the solids in the whey.

Operative method.—Coagulate the milk by adding to the sample a trace of dry rennet, or of rennet (lab.) ferment in powder. Throw on a filter and collect the whey.

Determine the density of the whey at 15°. For normal milk, it varies from 1·029 to 1·031. M. Lescœur admits a minimum of 1·027.

Then determine the solids in the whey, operating as for full milk. The solids of a normal milk vary from 6·7 to 7·1 grammes per 100 c.c. A content below 6·7 grammes indicates a watered milk.

M. Lescœur tests the curdled milk by filtering and operating as above on the filtrate. The characters of the filtrate are the same as those of the whey coagulated by the rennet.

The presence of lactic acid formed at the expense of the lactose does not appear to sensibly modify the results.

Interpretation of the results. — The milk will be declared adulterated when the density of the whey at 15° is below 1·027 and the solids-content of the whey is below 6·7 grammes per 100 c.c.

According to M. Lescœur, the composition of the whey separated from the milk after coagulation is independent of the abstraction of cream which may have been previously performed, and if the milk is coagulated by rennet, a serum is obtained which, normally, possesses as a minimum a density of 1·027 and a solids content of 6·7 gr. per 100 c.c. The serum of naturally curdled milk presents the same characters.

It is however to be noted that the abstraction of cream removes a variable portion of the casein, and that on the other hand the coagulation of the casein is never complete.

It would therefore, it seems, be useful to verify the indications of M. Lescœur; the figures which he gives, having regard to the above observations, may not have the definiteness which he attributes to them.

In sum, he fixes a minimum for the solids freed from butter and deprived of casein (in part) by coagulation.

Would it not be more exact, in the case of milk deprived of cream, to determine the solids, the quantities of casein and fat remaining, and to subtract these from the solids, which would then represent only the sum of the other constituents, lactose and mineral matter, and would be independent of abstraction of cream?

(5). Test for watering by examination of filtered milk. —To annihilate the influence of the abstraction of cream upon the tests for watering, would it not be preferable to operate on the milk freed, by filtration, from the substances in suspension (fat and insoluble casein)?

As it is the fat, of which the quantity is very variable, which has the greatest influence on the solids content, the natural variations of the solids content, in the filtrate, would then be contained within narrower limits.

According to Chevalier, the density of filtered milk is almost constant (1·033).

It would be useful to apply tests to determine the limits between which, in filtered milk, the solids, the soluble casein, the lactose, and the ash vary.

C.—From Arthur F. G. Leveson-Gower, Esq., to the Secretary of State for Foreign Affairs.

(No. 35—Commercial).

My Lord, The Hague, 23rd April 1900.

With reference to your Lordship's despatch, No. 14 Commercial, of the 14th March, requesting me to furnish a report containing the latest available information respecting the standard of purity in milk, condensed milk, or cream, authorized by law or officially recognized for administrative purposes in the Netherlands, I have the honour to report that I have been officially informed that no such standard exists in the Netherlands.

I have, &c.,
(Signed) ARTHUR F. G. LEVESON-GOWER.

The Marquess of Salisbury, K.G.,
&c., &c., &c.

D.—From the Hon. Alan Johnstone to the Secretary of State for Foreign Affairs.

(No. 24—Commercial).

My Lord, Copenhagen, 18th May 1900

I have delayed answering your Lordship's despatch, No. 9—Commercial, of the 14th March last, as to the standards of purity for milk, condensed milk or cream which are authorised by law or officially recognised in this country, as a Sanitary Committee is now sitting here to report on the question of the standard of purity for milk in Copenhagen.

This Committee has not hitherto reported, and, as the Board of Agriculture may perhaps think that the report on the subject expected from Denmark has been overlooked, I have thought it right to send information respecting the present standard, and I shall forward the details as to the conclusions arrived at by the committee and the steps taken to enforce them as soon as such details are published.

The standard adopted by the municipalities of Copenhagen and by some other towns for milk is that of 2½ per cent. of fat, but there is no State law directly enforcing any standard throughout the Kingdom.

Hitherto even if a sample of milk taken by the sanitary inspectors is proved, on analysis, to contain less than 2½ per cent. of fat, the vendor of the milk is not punished if he can show to the satisfaction of the authorities that the milk in question came direct from the cow and was not adulterated.

The authorities are empowered to take samples from the farm where such milk was procured, and should it prove pure, although wanting in fatty substance, the vendor of the milk below the standard is not liable to a fine.

There is no standard for fat in cream, but should cream be adulterated in any way by flour or other substances the vendor is liable to be punished according to the law for the prevention of the adulteration of articles of food of 2nd March 1900, copy of which is herewith enclosed.

The above law is the only regulation controlling the purity of condensed milk, which is almost entirely a Swiss preparation. The milk condensed by Casses' and Tjelstrup's Danish Patents has never kept for any length of time.

I gather from Herr Schou, the Danish Government Veterinary Authority, that Major Craigie, of our Agricultural Department, is fully aware of all the precautions taken by Danish dairies to prevent the spread of disease by infected milk, but I enclose, in this connection, the law of the 31st March 1900, for dealing with contagious diseases. Paragraph 18 of this law lays down special rules with regard to dairies.

As the Board of Agriculture are aware, all milk sold for cattle food must first be heated to 68° Reaumur.

I am unable to obtain any information as to the effect which the standard of 2½ per cent. of fat has had on the milk supply of Denmark.

In this connection I enclose translation of a report on the milk supplied to Copenhagen, published by Mr. Frijs, Veterinary Surgeon to the Municipality, which has been submitted to the Sanitary Committee for their information and guidance in drawing up their report.

I have, etc.,
(Signed) Alan Johnstone.

The Marquess of Salisbury, K.G.,
&c. &c. &c.

[D 1.—Enclosure].

As regards the public inspection of milk it has been carried out for many years with the view of preventing adulteration, consisting in visits without warning by a police official to the milk dealers, and the testing of the specific gravity of the milk. If same were found too high, samples were submitted for chemical analysis at the Laboratory of the Sanitary Commission. This method has now been abandoned, and the following substituted for it. Several times a week samples of milk are purchased, which are at once handed over to the above-mentioned laboratory, where they are immediately submitted to a preliminary examination with regard to the percentage of fatty substance. In the event of same proving to be less than 2·5 per cent., the Sanitary Commission is informed thereof, and they then order the taking of stall samples from the suppliers. The comparison of the stall samples with the previously purchased samples of milk furnishes, with regard to the fresh unskimmed milk, a splendid standard, which prevents any possible deviation at the subsequent legal examination. Below will be found a summary of the examinations of fresh milk carried out at the Laboratory of the Sanitary Commission from 1888–1895 as to the amount of fat:—

—	1888.	1889.	1890.	1891.	1892.	1893.	1894.	1895.
From 0·5 to 1·0 per cent. - -	—	—	1	1	—	2	—	—
,, 1·0 ,, 1·5 ,, - -	1	1	3	2	1	—	—	1
,, 1·5 ,, 2·0 ,, - -	4	3	5	2	10	1	5	2
,, 2·0 ,, 2·5 ,, - -	30	14	19	13	73	17	22	12
,, 2·5 ,, 3·0 ,, - -	74	67	76	46	269	121	128	133
,, 3·0 ,, 3·5 ,, - -	77	45	81	38	328	261	198	223
,, 3·5 ,, 4·0 ,, - -	31	23	38	15	106	115	90	144
,, 4·0 ,, 4·5 ,, - -	7	5	7	1	20	35	17	32
,, 4·5 ,, 5·0 ,, - -	6	—	1	—	8	2	7	13
,, 5·0 ,, 5·5 ,, - -	1	—	1	—	2	1	3	—
,, 5·5 ,, 6·0 ,, - -	1	—	1	—	1	1	3	2
,, 6·5 ,, 7·0 ,, - -	—	—	—	—	—	—	1	—
,, 7·0 ,, 7·5 ,, - -	1	—	—	—	—	—	1	2
,, 7·5 ,, 8·0 ,, - -	—	—	—	—	—	—	1	—
,, 8·5 ,, 9·0 ,, - -	1	—	—	—	—	—	—	—
,, 9·0 ,, 9·5 ,, - -	—	—	1	—	—	—	—	—
,, 11·5 ,, 12·0 ,, - -	—	—	—	—	—	—	—	1
Total number of samples of fresh milk - -	234	158	234	118	818	556	476	565

Amount of fat has accordingly been :—

—	1888.	1889.	1890.	1891.
	Number of samples.	Number of samples.	Number of samples.	Number of samples.
From 2·5 to 4 per cent. - - -	185 = about 78%	135 = about 86%	195 = about 83%	99 = about 84%
Below 2·5 per cent. - - -	13 = ,, 15%	18 = ,, 12%	28 = ,, 12%	18 = ,, 15%
Above 4 per cent. - - - -	17 = ,, 7%	5 = ,, 3%	11 = ,, 5%	1 = ,, 1%

SUMMARY of EXAMINATIONS of FRESH MILK, &c.—*continued.*

—	1892.	1893.	1894.	1895.
	Number of samples.	Number of samples.	Number of samples.	Number of samples.
From 2·5 to 4 per cent.	703 = about 86%	496 = about 89%	416 = about 87%	500 = about 88%
Below 2·5 per cent.	84 = „ 10%	20 = „ 4%	27 = „ 6%	15 = „ 3%
Above 4 per cent.	31 = „ 4%	39 = „ 7%	33 = „ 7%	50 = „ 9%

—	1888.	1889.	1890.	1891.	1892.	1893.	1894.	1895.
Average per cent. of all samples	2·12	3·00	3·10	2·94	3·09	3·28	3·26	3·36
Average after deduction of samples over 5 per cent.	2·06	3·00	3·05	2·94	3·08	3·27	3·21	3·32

The adulteration of fresh milk which occurs most frequently consists in the extraction of part of the cream from the milk or by the addition of skim milk to fresh milk and sometimes by a combination of both processes.

The addition of water to milk is however quite exceptional. It has never been proved that chemical substances, such as boracic acid, borax, &c., have been added to milk, and the adulteration of cream by addition of flour is very seldom, notwithstanding that cream is often subjected to the iodine test by the police when purchasing samples.

The following is a table of the adulterations of fresh milk and cream ascertained from 1888 to 1895.

Year.	Examinations made.	Adulterations ascertained.
1888	348	5
1889	1,264	30
1890	1,424	10
1891	1,368	25
1892	910	26
1893	728	11
1894	960	4
1895	975	7

E.—From Sir E. MONSON to the SECRETARY OF STATE FOR FOREIGN AFFAIRS.

Paris, April 27th, 1900.

No. 111, Commercial.

My Lord,—In accordance with the instructions contained in your Lordship's despatch No. 46, Commercial, of the 14th ultimo, I have the honour to transmit herewith a memorandum by Mr. Austin Lee, containing the information asked for respecting the inspection of milk in Paris and the French provinces, with a view to the detection of any adulterous process.—I have, &c.,

(Signed) EDMUND MONSON.

The Marquess of Salisbury, K.G., etc., etc., etc.

E. 1.—MEMORANDUM.

No special law exists in France with regard to the sale of milk, nor is there any legal standard of purity beyond the regulations fixed by the Prefect of Police in Paris, for the Department of the Seine, and by the Mayors of the different communes in the provinces.

Prosecutions, however, for the adulteration of milk take place in virtue of the Law of the 27th March, 1851, and Article 423 of the Penal Code, which punish any person convicted of adulterating or offering for sale adulterated or deteriorated foodstuffs, with imprisonment for a period of not less than three months and not exceeding one year, and a fine of not less than 50 francs. The Court, however, has the right of reducing the punishment in accordance with Article 463 of the Penal Code.

A copy of a recent judgment is enclosed* which was pronounced by the Paris Police Court against a dairy keeper for adulteration of milk, and which, by order of the Court, was published in two Paris newspapers. In certain cases, when the charge is serious, the Court may order the judgment to be inserted in more than two newspapers, as well as to be placarded on the delinquent's door, and in the neighbourhood of his shop.

The annual consumption of milk in Paris is about 250 million litres (55 million gallons), or about half-a-pint a day per inhabitant.

Notwithstanding the strict regulations existing, it is stated that the milk sold in Paris is rarely pure; and, as a general rule, some of the cream has been extracted or water has been added. In other cases it is adulterated with starch, flour, malt, white of eggs, dextrine, sugar, emulsion of almonds or hempseed, calf, sheep, and horse brains, and even oil treated with sulphuric acid.

The Paris Municipal Laboratory analyse free of charge to the public samples of milk, which must be supplied fresh and of not less than a pint in quantity.

According to statistics published for the year 1897 the Paris Municipal Laboratory made 4,758 analyses of milk; 2,626 samples were pronounced as good, 974 as skimmed (écrêmé), 517 as watered, 438 as mediocre, and 203 as bad.

There is a regular service of milk inspectors in Paris belonging to the Municipal Laboratory, who visit every week twelve districts of Paris and suburbs. The inspectors procure samples of milk from the cow-feeders and milk shops of their districts, analyse them, and furnish reports to the Director of the Municipal Laboratory, who forwards them to the Police Authorities in cases where a prosecution is warranted.

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*This is not printed.

The inspectors are instructed to procure the samples in the early morning, as the principal sale of milk is over by nine o'clock, and to pay attention to the taste and smell of the milk. The samples are to be taken from the recipients which look suspicious, and the milk is to be well stirred with a ladle and poured out in such a manner that all the milk is thoroughly mixed. Samples should afterwards be taken from the middle of the vessel, and also from the recipients containing milk freshly arrived before part of it has been sold to the public.

If the retailer affirms that the milk is such as has been supplied to him by the cow-feeder, the inspector returns the following day at the hour when the milk is brought in, and procures from the dairyman samples taken from the recipients before they have been opened by the dealer, noting at the same time how the vessels were closed or marked, as well as any further particulars useful for the prosecution.

If the retailer admits at once that the milk has been adulterated, no sample need be taken, but an official memorandum of the facts is drawn up and signed by the retailer, to be afterwards forwarded to the proper authorities. Should the retailer's statement appear insufficient, a sample of the milk is taken in order to verify the declaration, and all the samples are handed in to the Municipal Laboratory the same day before noon.

Besides this regular inspection there exists a special service on the public streets and railway stations, which is carried out in the following manner:—

The special police agents at the railway stations take, at irregular intervals, samples of the milk on its arrival, and forward them to the Municipal Laboratory, where they are analysed, and if the milk is found to be adulterated a prosecution is instituted. In other cases, when suspicions of fraud have been aroused, the inspectors keep a look out in certain districts, streets, squares, and stations, and arrest the milk carts, which are brought to the nearest police office, where samples of the milk are then taken and transmitted to the Municipal Laboratory for analysis.

A statement furnished by the Prefecture of Police is enclosed, detailing the method pursued in the Paris Municipal Laboratory in the analysis of milk and also a copy of the decision of the Council of Public Health for the Department of the Seine with regard to the average degree of purity of milk on which the experts of the Municipal Laboratory base their analysis.

(Signed) H. AUSTIN LEE.

Paris, 27th April, 1900.

E. 2.—ANALYTICAL METHOD ADOPTED FOR MILK BY THE MUNICIPAL LABORATORY OF PARIS.

[Translation.]

Density.—A densimeter, specially graduated for milk, is used, giving half degrees. It is necessary to have a complete series of these densimeters. A series consists of three instruments, one graduated from 1020 to 1026, the second from 1026 to 1032, the third from 1032 to 1038.

The reading of the densimeter is, of course, taken above the meniscus; it is necessary to make the correction for temperature by means of special tables.

Density of the Whey.—The first determination is completed by taking the density of the whey; for this purpose about 200 c.c. of milk are coagulated by a little rennet, and the densimeter placed in the filtered liquid.

Creamometer.—The Quevenne creamometer is used. It is filled with milk up to the higher mark, and left for twenty-four hours in a basin with running water; at the end of this time the volume of cream is read off on the special graduation.

Total Solids at 95°.—This determination is made upon 10 c.c. of milk, which are introduced into a tared platinum dish, with a flat bottom, of 70 m.m. diameter, and left for eight hours in a water bath of a special form at a temperature of 95°. The product of the weighing multiplied by 10 gives the dried solids per 100 c.c. of milk.

Ash.—The dry residue is incinerated at a dull red heat, and the mineral matter is then weighed. If its proportion is abnormal a complete analysis of the ash is made.

Fat.—(1) Determination of the amount: A filter is placed in a funnel provided with a Mohr's pinch-cock, which is shut, and 90 c.c. of a liquid, prepared by mixing 1,000 c.c. of water with 2 c.c. of glacial acetic acid, are poured on the filter; 10 c.c. of milk are then measured and poured slowly into the acetic liquid. The casein coagulates, absorbing all the fatty matter; at the end of about an hour it is filtered by opening the Mohr's pinch-cock. The filter and its contents are dried in the open air or in a dessicator, then introduced into Dupré's exhaustion apparatus, and extracted for six to eight hours. The ether is slowly evaporated, and the flask of Bohemian glass, which contains the fatty matter dissolved by the ether, is weighed.

(2) Determination by Adam's Process: This determination is a control of the preceding one, and is carried out in the following manner:—Into a tapped separator of the shape of a double cone there are introduced 10 c.c. of milk and 20 c.c. of a liquor composed as follows:—

Ammonia - - - -	80 c.c.
Alcohol - - - -	2,400 c.c.
Ether - - - -	3,200 c.c.
Water - - - -	200 c.c.

The casein is entirely dissolved in this liquid, and the layer of ether which separates contains the fatty matter. The aqueous liquor is drawn off by means of the tap, and the ethereal layer, after again washing with water, is introduced into a tared vessel. The ether is slowly evaporated, and the vessel weighed.

Lactose.—The liquid separated by filtration and originating from the first process performed for the determination of the fat by exhaustion is introduced into a Gay-Lussac burette, and poured into a definite quantity of Fehling's solution rigorously carried to ebullition. The quantity of liquid necessary for the complete discoloration of Fehling's solution will be inversely proportional to the quantity of lactose contained in it; by calculation the weight for 100 c.c. of milk is obtained.

The casein is determined by difference.

The following antiseptics, which may be fraudulently added to milk, are also tested for by the usual methods: boric acid, bicarbonate of soda, chromate of potash, formalin, &c.

EXTRACT FROM THE REPORT OF THE HYGIENE COMMITTEE ON THE COMPOSITION OF THE MILK CONSUMED IN PARIS.

The Committee, in view of the great analogy which the results exhibit among themselves and with those obtained by MM. Boussingault and Lebel, Quevenne, Lyon, Playfair, Schubler, Vernois, and Becquerel, Joly and Filhol, under special conditions, as regards age of the milk and diet of the cows, and taking especially into consideration the data extracted from the work, as yet unpublished, of MM. Bouchardat and Quevenne, furnished by MM. Bussy and Boudet, as the result of very numerous experiments undertaken precisely with the object of estimating the average composition of the milk consumed at Paris and the extreme variations which this composition may offer under ordinary conditions, and remarking, moreover, that the minima are represented by a few rare samples, while the greater number of others approximate closely to the average composition, has held and holds, as sufficiently established, that cows' milk is composed on the average and in round numbers of

Water.	Total solids.	Casein and salts.	Milk-fat.	Lactose.
87	13·00	4·00	4 00	5·00
And that the minimum limit may be fixed at				
88·50	11·50	4·00	2·70 to 3·00	4·58

The Committee declares nevertheless that the minimum limit thus shown for the constituents of milk cannot be considered as an absolute limit proper to fix the point at which fraud commences, that it is not sufficient that a milk contain more than 11·50 of total solids or 2·7 of fat or 4·50 of lactose to be declared free from fraud and unexceptionable, and that the judgment of the expert chemists charged with the examination of the milk must result from a comparative appreciation of all the data of these analyses; that thus, for example, any sample may be considered as adulterated which has not only not shown, for the total solids which it contains a weight greater than 11·50, but also which, showing more than 11·50 of solids, does not contain at least 2·70 of fat and 4·50 of lactose.

May not the case, in fact, arise, that a milk very rich in solids, and containing an average proportion of fat, may be heavily skimmed, and thus reduced to a proportion of fat below 2·70 per cent., but retaining a proportion of solids greater than 11·50? In this case the fraud, *i.e.*, the abstraction of the cream, would be shown by the figure for fat, and its author would be justly condemned as guilty of having sophisticated his wares, even although the milk which he furnished contained proportions of total solids and lactose superior to the minima.

On the other hand, let us suppose that a milk rich in solids and in fat and containing an average proportion of lactose, has had water added to it in such proportion that the weight of solids and fat has not been reduced below the minimum, whereas the proportion of lactose on the other hand becomes inferior to 4·50, would it not be justifiable to conclude that the milk has been watered, and that it has been the object of a fraudulent manipulation, since its proportion of lactose has become inferior to the minimum.

Thus, as the Committee showed in its first report, the complete analysis of milk, the knowledge which it gives to the experts of the proportions of each of its elements, and the attentive discussion of these proportions, enables them to follow the adulterations of this liquid under all the conditions which they may present, and to recognise them within very wide limits.

The Committee further lays stress upon this consideration, viz., that, especially in the case of the fat and total solids, milk can only approach the minimum limits under special circumstances, and when it is furnished by single cows, and that in consequence these limits cannot be invoked in favour of wholesale milk dealers, who deliver mixed milk solely in the trade, drawn from several cows.

Average Composition of Pure Mixed Milk.

Density at 15° - - - - - - -		1033·00
Creamometer - - - - - - -		10
Water per 100 cubic centimetres - -		90·30
Total solids at 95° per 100 cubic centimetres - - - - - - -		13·00
Ash	,,	0·60
Butter	,,	4·00
Lactose	,,	5·00
Casein	,,	3·40

F.—From the Hon. Sir F. J. Pakenham, K.C.M.G., to the Secretary of State for Foreign Affairs.

Stockholm, July 7th, 1900.

No. 16. Commercial.

My Lord:—With reference to your Lordship's despatch No. 6 of this series of March 14th last, requesting information as to the standards (if any) of purity for milk, condensed milk or cream which are authorised by law or officially recognised for administrative purposes in Sweden, I have the honour to transmit, herewith, copy of a Note together with its enclosure, which I have received from Baron Lagerheim, from which it will be seen that no regulations on the subject exist in this country.

(Signed) F. Pakenham.

The Marquess of Salisbury, K.G. &c.

(F. 1.—Enclosure.)

Stockholm, Juillet 3, 1900.

Copie.

Monsieur le Ministre :—En réponse a votre lettre en date du 17 Mars dernier, relative aux prescriptions en vigueur en Suède concernant la pureté du lait, du lait condensé et de la crême, j'ai l'honneur de vous faire tenir, sous ce pli, un mémoire élaboré par l'administration royale de l'agriculture à Stockholm, d'ou il ressort que des prescriptions de ce genre n'existent pas en Suède.

(Signé) Lagerheim.

Sir F. Pakenham.

(F. 2.—Enclosure.)

Copy Translation.

Rules respecting the degree of cleanliness of milk, condensed milk, and cream have not so far been published by the Swedish authorities, the reason of which was that the need of such regulations was not apparent. There has been no complaint on the subject, because the public, without the interference of the authorities, could by a contract or some such deed, make themselves certain that the milk or cream at the purveyors was unadulterated, clean, and of good taste. This fortunate state of things has been brought about in a special degree by the carefulness and exactitude of the "personnel" of the dairies throughout the country in their examination of the milk from the purveyors, and their improved judgment in such matters, brought about by careful education for the business.

The milk purveyors, who were obliged to fall in with the demands of the dairies, for the delivery of pure milk, have on their side been obliged to see that the milk was handled in a careful manner, so that no unfavourable remarks should be made as to the cleanliness of the milk. For the present also the conditions existing in the dairy farms throughout the country may be looked upon as thoroughly satisfactory.

Stockholm, June 20th 1900.

G.—From the Right Hon. Sir F. C. Lascelles, G.C.B., to the Secretary of State for Foreign Affairs.

Berlin, October 12th, 1900.

No. 181. Commercial.

My Lord,—

With reference to your Lordship's despatches Commercial, Nos. 24 of March 14th and 96 of the 6th instant, I have the honour to transmit herewith, for the information of the Board of Agriculture, a translation of a memorandum, with which I have been favoured by the German Government, on the regulation of the milk trade in Germany, and also a copy and translation of a Circular Decree on the same subject issued by the Prussian authorities on May 27th, 1899.

Your Lordship will observe that it is stated that a considerable improvement in the quality of the milk has manifested itself since the matter was dealt with by police ordinances, and that the number of prosecutions for milk adulteration is decreasing in certain towns.

I have, &c.,

(Signed) Frank C. Lascelles.

The Marquess of Salisbury, K.G., &c., &c.

Memorandum.

The question of the treatment of cow's milk is regulated in the German Empire by the Imperial law of May 14, 1879, relative to the treatment of articles of utility and human consumption. A special Imperial milk law has not been enacted, as the quality of milk is influenced by local conditions, the species of the cattle, the nature of their fodder, and other circumstances, so that it would not have been possible to frame uniform regulations for the whole Empire without injury to the producer.

On the other hand, regulations exist in the separate States of the Empire on the subject of the treatment of milk. In Prussia, for example, the competent officials have quite recently drawn up new principles upon which the regulation of the milk question should be founded. By a circular dated May 27, 1899, copies of these general principles were furnished to all the district governors (Regierungspräsidenten), and to the President of Police at Berlin, with instructions to regulate the question of the treatment of milk, in accordance with those principles, wherever a necessity for such regulation might show itself, due allowance being made for special local conditions.

In Bavaria, the Ministry of the Interior issued a police regulation on July 15, 1887, relative to the treatment of milk, with the proviso that the issue of further regulations required by local conditions should be left to the discretion of the authorities on the spot.

In Wurtemberg regulations on this subject were enacted by an Ordinance of the Ministry of the Interior, dated April 24, 1886.

In Saxony the Ministry of the Interior issued a circular decree to the Provincial Councils on June 23, 1889, on the subject of the treatment of milk.

In Baden this question was regulated by a decree of the Ministry of the Interior of June 17, 1884, and it is provided that more complete regulations may be enacted by the district and local police authorities in the interests of the public health.

In Alsace-Lorraine a Ministerial circular was addressed to the District Governors on March 14, 1890, for the purpose of organising a control over milk, in which the authorities in the towns and larger boroughs were recommended to establish a permanent control over milk, for fear of adulterations, and the urban officials were advised to issue special police ordinances with that object. On the strength of the above decree, a milk inspection took place in 1892 in no less than fifty-four boroughs in Alsace-Lorraine, while police ordinances on the subject of the milk traffic were issued in eleven boroughs.

There are also special police ordinances regulating the treatment of milk in force in many districts and cities of Germany.

In consequence of the issue of these police ordinances, which were invariably adapted to local conditions, a considerable improvement in the quality of milk manifested itself in the relative towns. In Düsseldorf, for example, the cases of adulteration sank in four years to one-third, and the cases of infringements of the police regulations to one-fifth of their former number.

The samples of milk which were analysed gave the following results:—

In the year.	Adulteration.	Of inferior quality.*
	Per cent.	*Per cent.*
1894–5	12	24
1895–6	8	18
1896–7	4·4	5·7
1897–8	4·2	5·0

* In the sense of the police decree.

In Hamburg the percentage of complaints has likewise sensibly diminished since the issue of the milk law of April 18, 1894.

So far as the Imperial Health Office are aware there are no special police regulations in force with regard to the treatment of cream and condensed milk.

It may be observed in conclusion that in accordance with the decision of a Commission of German Chemical Experts on Food Commodities the proportion of fat in cream should amount to at least 10 per cent.

PRUSSIA.

Circular decree respecting the regulation of the Milk trade of May 27th, 1899.

The general principles recommended in the circular decree of January 28th, 1884, relative to the trade in milk, appear to us to be no longer applicable in all their details; after taking the opinion of experts as well as of parties interested in agriculture and commerce, we have caused the general principles relative to the trade in milk, which are contained in the accompanying document to be drawn up. For the reasons stated in the circular of 28th January, 1884, it has not been found possible to draw up regulations which could be applied uniformly throughout the country. We therefore request that a copy of these general principles may be furnished to each of the district governors, with instructions to cause police decrees or other police measures to be enacted for the regulation of the milk traffic, in accordance with these principles whenever a necessity therefor should arise, due regard being paid to special local conditions.

(Signed)
J. V. Bartsch,
Minister of Ecclesiastical, Educational, and Medical Affairs.
J. A. v. Bitter,
Minister of the Interior.
J. V. Sterneberg,
Minister of Agriculture, Domains, and Forests.
J. A. Hoeter,
Minister of Commerce.

General Principles for the Regulation of the trade in Cow's Milk*:—

I.—Sanitary Police Inspection.

1. All traffic in fresh, boiled, and sterilized cow's milk, sour and buttermilk, is to be subjected to a sanitary police inspection.

For this purpose persons carrying on trade in milk must report themselves to the local police.

2. Fresh cow's milk may be sold as whole milk, half milk, or skim milk. As far as local conditions permit half milk is, on account of its varying characteristics (specific gravity, amount of fat), to be gradually excluded from sale.

(*a*) Whole milk is to be considered milk that after milking has been in no way skimmed or otherwise altered, which has a specific weight of at least 1,028, and contains at least 2·7 per cent. of fat.

(*b*) Half milk is milk that is prepared by mixing whole milk with skim milk or by partial skimming, and must have a specific weight of at least 1,030, and contains 1·5 per cent. of fat.

(*c*) Skim milk is the product of whole milk by removing the cream after it has stood some time or by means of a separator, and must have a specific weight of at least 1,032, and contain at least 0·15 per cent. of fat.

3. The testing of the specific weight of the milk must take place when the milk is at a temperature of 15° C., or its temperature must be raised to that height. The calculation can be best carried out by means of a scale connected with the milk gauge (Milchwage), or by employing a calculating table.

As the specific weight of the milk varies according to the amount of fat, in the case of whole milk between 1,028 and 1,034, of half milk between 1,030 and 1,036, and of skim milk between 1,032 and 1,037, the amount of fat of the milk examined must also always be ascertained.

When the milk stands in vessels, or when it is shaken in carriage by hand or in vehicles, &c., the cream, which is the lighter portion, rises to the surface. To avoid mistakes the milk to be examined must, therefore, before a sample is taken to test the weight and amount of fat, be stirred round in the vessel in which it is standing or poured from one vessel to another, so as to carefully mix it, in order to effect an equal distribution of the cream.

The sample taken in this way is, first of all, roughly tested in the receptacle of the milk gauge (Areometer) for colour, smell, and taste. If an unusual colour, unusual, *i.e.*, offensive smell, or taste is remarked, the milk is to be withdrawn from sale and chemically and bacteriologically examined without delay. For this purpose samples of the doubtful milk are to be filled in carefully cleaned half-litre bottles, which are closed with a new cork, officially sealed, and without delay delivered to a competent food analyst. The chemical and bacteriological examination must be rapidly executed and completed, in order that milk detained by the police may, if not condemned, be released before it turns bad.

4. Milk that has turned sour may be recognised by the taste, and further by the fact that when testing the specific weight the casein clings to the milk gauge spindle in the form of an irregular deposit.

After the rough testing the milk gauge should be sunk slowly and carefully into the milk sample taken, and left in it at least two minutes before the specific weight is read off. While reading off the figures the quicksilver bulb of the milk gauge must remain completely under the upper surface of the milk.

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* The trade in sheep's, goat's, or asses' milk is governed by the same regulations, in so far as the peculiarities of these animals will permit.

5. In all doubtful cases of the latter kind also the chemical examination of the milk must be carried out by a competent food analyst.

6. The fatty contents of the cream should correspond to the local conditions; a minimum fatty amount cannot be fixed above 10 per cent.

The fatty contents of milk or cream can be best determined by Gerber's acidobutyrometrical method, but on account of the difficulty of the examination it can only be entrusted to skilled analysts or market police officials.

7. Boiled or sterilized milk is only to be sold as such.

Simply boiled milk must not be described as sterilized milk. Boiled milk is milk which has been heated up to 100degs. C., or exposed to a temperature of 90degs. for at least fifteen minutes.

Sterilized milk is milk which is immediately after milking freed from dirty particles and at latest 12 hours after milking properly treated in an apparatus recognised by experts as effective, and which is during the heating fitted with an air-tight cover, which must remain untouched until the milk is delivered to the consumers.

8. The following are excluded from the trade:—

(*a.*) Milk which is taken a few days before calving and within six days after calving.

(*b.*) Milk from cows which are suffering from anthrax, pleuro-pneumonia, emphysema, rabies, cow-pox, diseases with jaundice, dysentery, inflammation of the udder, blood poisoning, viz., pyæmia, septicæmia, putrid inflammation of the womb, or other feverish complaints, as well as milk from cows from which the afterbirth has not yet gone, or which have a morbid discharge from the generative organs.

(*c.*) Milk from cows which are being treated with poisonous medicines which pass into the milk (arsenic, tartar emetic, sneeze-wort, opium, eserin, pilokarpin, and other alkaloids).

(*d.*) Milk from cows which are suffering from tuberculosis of the udder or from tuberculosis with strongly-marked wasting away or diarrhœa (scouring).

(*e.*) Milk which contains foreign bodies, such as ice, and especially any chemical preservative whatever.

(*f.*) Milk which is coloured blue, red or yellow, contains mildew fungi, is bitter, putrid, slimy, or is spoilt in any way, or contains particles of blood or coagulated blood.

9. Milk from cows which are suffering from foot and mouth disease or tuberculosis, which is not included under paragraph 8 (*a*) may be only sold when boiled or sterilized.

10. Sour milk and butter milk may not be prepared from milk of the origin described in paragraphs 8 (*a*) to (*f*), and may be only sold under its proper designation.

Children's Milk.

Special places for the production and sale of children's milk, which of late have increased, and bear various names, such as "sanitary dairies," "sale of healthy milk," "children's milk," "selected milk," etc., have to be especially carefully supervised by health officers. The business, the cleaning of the stalls as well as of the dairies and vessels, the state of health, the fodder and care of the cows in towns to be subject to veterinary control.

The stalls must be roomy, light and airy, with impermeable and easily cleansed floors, and similar cribs, and provided with flushing and good draining arrangements. Only cows which provide children's milk, may be placed in the stalls, which must be described as such in an indelible manner.

Regulations cannot well be laid down for the feeding of milch cows; but attention may be directed to the known injurious effects upon children of milk produced by cows fed on certain foods.

Feeding with dairy leavings should be generally forbidden, as it favours the spreading of tuberculosis through its bacilli-contents.

Cows which are intended to supply children's milk must before being used for this purpose be examined by an official veterinary surgeon. The examination is to be repeated every three months.

A record is to be kept of the examinations. The official appointed for that purpose must have the power of consulting the record at any time.

Every attack of the illnesses mentioned in paragraphs 8 and 9 among the cows in a special dairy must be reported to the competent veterinary official, irrespective of the prescribed notice to the police. Cows suffering from gastric disorders, diarrhœa, or cachexia, or suffering from or suspected of tuberculosis, must be immediately removed from the stalls and isolated pending examination by the official veterinary surgeon.

The milk from such cows may not be sold as selected or special milk.

The use of straw used for bed or other purposes and of refuse as litter in such stables is forbidden.

The children's milk cows should be kept especially clean, the udders must be carefully cleansed before milking. The milkers have to practice the greatest cleanliness, and to wash their arms and hands before milking, and to put on clean aprons. Persons suffering from eruptions or infectious diseases may not be employed as milkers.

If the milk for such special businesses is drawn from elsewhere it should be demanded that the milk in the cans in which it is transported has no higher temperature than 10degs. C., and when passed on to consumers has no higher degree of acidity than 2 to 4 degrees, according to Soxhlet.

II. TREATMENT OF THE MILK AFTER MILKING UNTIL ITS DELIVERY TO CONSUMERS.

1. Vessels made of copper, brass, zinc, burnt earthenware with bad or defective glaze, iron with enamel containing lead, or which is cracked or broken, or rusty vessels, are not suitable as receptacles for milk, as milk can take up harmful matters from such vessels. Cans should have covers.

2. Children's milk should be sold in uncoloured (white or half white) glass vessels.

3. Milk vessels of two litres or more capacity should have an opening wide enough to admit an adult's hand for cleaning purposes.

Vessels for measuring milk must also be made of an unobjectionable material (see point 1), and have a suitable handle, so that the hand of the person measuring cannot touch the milk.

4. Rags, paper, etc., should not be allowed as a means of fastening or making tight milk vessels; straw should be avoided for such purposes, and when it is indispensable, as is often the case with wooden vessels, it should be clean straw, and then only used once. India-rubber rings for making vessels water-tight should have no lead in them. (Law of June 25th, 1887, para. 2 R.G. Bl. S. 273).

Wooden milk vessels are to be abolished after a reasonable period of grace.

All milk vessels and milk measures are to be kept scrupulously clean; cold water and soda solution are not to be used for cleaning the vessels.

5. Spigot taps of milk vessels or of closed milk vans must be made of an inoffensive material (point 1), or be well-tinned and always kept clean inside.

6. Transport cans and cans for milk to stand in must bear legible and irremovable designations of the contents. Labels pasted or tied on are not allowed. The execution of this regulation should be unconditionally enforced for vessels used in the transport or sale of milk.

Vessels in which milk is exposed for sale must be so placed that the buyer can read the description. Vessels in which milk is sold to individual customers may bear a removable designation.

In the case of closed milk vans the descriptions and prices can be best placed on the side of the van, just above the out-flow tap.

7. The use of milk vessels of any kind for other purposes is prohibited under a penalty.

The greatest cleanliness is to be observed both in milking cows in stalls or in the fields, and also in forwarding the milk by road or rail. Any neglect should be censured by the competent authority, and if repeated is to be punished.

8. Milk that is for sale must be kept in rooms which are kept always clean and tidy, and especially as far as possible free from dust; they are to be well aired every day without exception, and kept cool, and not used as a sleeping or sick room, or allowed to be in direct communication with such rooms.

Any door which connects sleeping or sick rooms to selling rooms must always be kept locked.

It must be left to the official medical officer concerned to decide what precautionary measures may be required in case of infectious illness in the household of the milk producer or milk-seller.

These measures must be ordered and their execution supervised, by the proper authorities.

III. THE STALL TEST.

The stall test takes place when it is asserted that the milk objected to is in the same condition as when it left the place of production. For this purpose not later than three days after the objection to a milk on the market, the cows which have yielded the doubtful milk are to be milked at the same time as when the milk objected to was obtained, in the presence of the objecting official. This only applied to whole milk. It must first be ascertained whether the milk comes from one or several cows.

The milk from those cows which have yielded the contested milk, must be milked carefully into one single vessel, be well mixed, and completely cooled down and free from froth, in order to avoid errors, before the second test takes place in the stall.

The proof of exculpation furnished by the stall test may be treated as void, if

1. Since the milking of the contested sample a change of feeding has been resorted to which notoriously causes a deterioration of the milk, and if

2. Between the production of the contested milk and the sample taken at the stall such differences appear that the specific gravity of the stall sample varies from that of the contested sample by two degrees, and if

3. The fatty contents of the stall sample show more by 0·3 per cent., or the dry substance of the said sample is found to be higher by more than 1 per cent., than in the contested sample.

In doubtful cases a repetition of the stall test may be considered necessary.

Punishments for infractions of the regulations issued need only be made public when the judge has decreed the publication.

APPENDIX No. XXXV.

Handed in by Mr. S. W. FARMER.

The following Tables of ANALYSES of MILK supplied to the AYLESBURY DAIRY COMPANY by Mr. S. W. FARMER from Farms in his occupation, were Compiled by Mr. H. Droop Richmond (the Company's Analyst) from his Laboratory Records.

NOTE.—In the year 1899 the analyses are of individual churns.

In the year 1900 the analyses are of the mixed bulk supplied at one meal, except in the month of May when on one or more days the whole of the churns were individually examined, as shewn in Tables 2A. to 2H.

TABLE 1A.—FARM No. 1.

Date.	MORNING MILK.								EVENING MILK.							
	Fat.			Solids not Fat.			Number of Samples.	Number under 3 per cent. Fat.	Fat.			Solids not Fat.			Number of Samples.	Number under 3 per cent. Fat.
	Minimum.	Maximum.	Average.	Minimum.	Maximum.	Average.			Minimum.	Maximum.	Average.	Minimum.	Maximum.	Average.		
Jan. 1899	3·30	4·15	3·71	8·90	9·25	9·10	26	–	3·50	4·30	4·01	8·90	9·20	9·05	28	–
Feb. ,,	3·45	4·05	3·67	8·80	9·35	9·11	24	–	3·75	4·45	4·08	8·80	9·25	9·07	24	–
March ,,	3·05	4·25	3·71	8·85	9·35	9·09	26	–	3·75	4·45	4·17	8·90	9·20	9·03	24	–
April ,,	3·35	4·35	3·83	8·75	9·40	8·98	24	–	3·75	4·65	4·22	8·75	9·25	8·98	24	–
May ,,	2·85	3·95	3·43	8·75	9·20	9·02	28	1	3·50	4·30	3·86	8·85	9·20	9·03	26	–
June ,,	2·90	3·90	3·32	8·70	9·15	8·98	22	3	3·55	4·25	3·84	8·80	9·25	8·97	20	–
July ,,	2·90	3·90	3·46	8·60	9·10	8·81	26	2	3·50	4·30	3·95	8·55	9·00	8·75	26	–
August ,,	3·35	4·25	3·81	8·55	9·05	8·72	18	–	3·45	4·55	4·04	8·20	8·95	8·65	24	–
Sept. ,,	3·45	4·40	3·88	8·60	9·10	8·87	13	–	3·75	4·45	4·17	8·65	9·00	8·81	16	–
Oct. ,,	3·45	4·05	3·77	8·80	9·20	8·97	13	–	3·65	4·85	4·10	8·75	9·10	8·93	22	–
Nov. ,,	2·95	3·95	3·45	8·60	9·15	8·93	24	1	3·20	4·45	3·73	8·65	9·10	8·91	26	–
Dec. ,,	3·05	3·85	3·46	8·85	9·40	9·08	12	–	3·25	4·15	3·67	8·80	9·20	8·97	24	–
Jan. 1900	3·25	3·55	3·40	9·00	9·20	9·06	14	–	3·65	4·10	3·78	8·85	9·05	8·96	13	–
Feb. ,,	3·30	3·75	3·52	8·85	9·30	9·10	12	–	3·55	4·05	3·83	8·95	9·10	9·01	12	–
March ,,	3·20	3·60	3·41	8·85	9·30	9·15	14	–	3·60	3·90	3·77	8·90	9·15	9·01	13	–
April ,,	3·20	3·50	3·33	8·65	9·15	8·91	11	–	3·55	4·00	3·73	8·65	9·05	8·84	12	–
May ,,	3·05	3·55	3·29	8·85	9·30	9·07	28	–	3·25	4·05	3·72	8·90	9·25	9·07	26	–
June ,,	3·20	3·55	3·38	8·90	9·10	9·00	13	–	3·55	4·00	3·84	8·85	9·05	8·93	12	–

TABLE 1B.—FARM No. 2.

Jan. 1899	3·30	4·25	3·74	8·90	9·35	9·13	26	–	3·05	5·15	4·27	9·05	9·50	9·21	26	–
Feb. ,,	3·35	4·15	3·76	8·90	9·15	9·05	24	–	3·45	4·65	4·23	8·90	9·40	9·16	24	–
March ,,	3·35	4·00	3,68	8·90	9·30	9·11	26	–	3·35	4·55	3·99	8·85	9·40	9·14	28	–
April ,,	3·45	4·05	3·69	8·90	9·15	9·02	24	–	2·75	4·35	3·69	8·95	9·25	9·10	24	2
May ,,	3·30	3·95	3·56	8·80	9·25	9·02	24	–	2·45	4·55	3·88	9·00	9·25	9·11	26	1
June ,,	2·85	3·65	3·36	8·80	9·20	9·00	20	1	3·25	4·20	3·72	8·85	9·15	8·96	22	–
July ,,	3·20	3·95	3·51	8·60	9·05	8·89	24	–	2·65	4·65	3·82	8·55	8·95	8·80	26	2
August ,,	3·45	4·25	3·78	8·60	9·00	8·77	19	–	2·55	4·35	3·74	8·50	9·00	8·68	20	1
Sept. ,,	3·25	4·75	3·69	8·75	9·10	8·93	13	–	2·95	4·35	3·78	8·80	9·15	8·97	13	1
Oct. ,,	3·35	3·85	3·73	8·75	9·15	9·05	13	–	3·45	4·45	3·99	8·90	9·35	9·08	14	–
Nov. ,,	3·25	4·05	3·59	8·80	9·20	9·04	13	–	3·45	4·40	3·82	8·80	9·20	9·00	13	–
Dec. ,,	3·30	3·75	3·52	8·90	9·20	9·08	12	–	3·65	4·15	3·83	9·00	9·45	9·17	12	–
Jan. 1900	3·30	3·60	3·46	9·00	9·20	9·10	13	–	3·40	4·25	3·79	9·00	9·40	9·18	14	–
Feb. ,,	3·30	3·70	3·45	8·90	9·20	9·07	12	–	3·30	4·10	3·74	8·90	9·15	9·06	12	–
March ,,	3·20	3·70	3·47	8·85	9·15	8·99	13	–	3·55	4·10	3·77	8·85	9·10	9·01	13	–
April ,,	3·15	3·60	3·40	8·85	9·05	8·94	12	–	3·40	4·30	3·77	8·80	9·15	8·96	12	
May ,,	3·05	3·55	3·25	8·90	9·15	9·06	25	–	3·30	4·10	3·70	8·85	9·20	9·04	24	
June ,,	3·10	3·60	3·32	8·85	9·10	8·94	12	–	3·60	4·20	3·87	8·90	9·15	9·02	12	–

TABLE 1C.—FARM NO. 3.

Date.	MORNING MILK.								EVENING MILK.							
	Fat.			Solids not Fat.			Number of Samples.	Number under 3 per cent. Fat.	Fat.			Solids not Fat.			Number of Samples.	Number under 3 per cent. Fat.
	Minimum.	Maximum.	Average.	Minimum.	Maximum.	Average.			Minimum.	Maximum.	Average.	Minimum.	Maximum.	Average.		
Jan. 1899	3·45	4·05	3·75	8·90	9·40	9·06	26	–	3·80	4·50	4·14	8·95	9·45	9·20	26	–
Feb. „	3·40	4·25	3·78	8·90	9·25	9·11	24	–	3·05	4·75	4·12	8·90	9·45	9·16	24	–
March „	3·35	4·15	3·85	8·95	9·35	9·11	26	–	3·65	5·00	4·34	8·95	9·50	9·23	28	-
April „	3·55	4·25	3·87	8·85	9·30	9·08	24	–	2·85	5·00	4·17	8·85	9·35	9·15	24	1
May „	3·15	4·35	3·81	8·90	9·40	9·13	24	–	2·95	5·05	4·20	9·00	9·35	9·15	26	1
June „	3·05	7·95	3·72	8·70	9·25	9·03	20	–	3·65	4·85	4·07	8·85	9·10	9·00	22	–
July „	3·05	3·80	3·54	8·55	9·10	8·87	24	–	3·60	4·55	3·98	8·45	9·00	8·73	26	–
August „	3·45	3·95	3·65	8·45	8·85	8·71	19	–	3·65	4·75	4·07	8·35	8·75	8·55	20	–
Sept. „	3·35	4·15	3·76	8·75	9·10	8·88	13	–	3·35	4·55	4·13	8·65	9·30	8·90	13	–
Oct. „	3·25	4·30	3·65	8·95	9·25	9·10	13	–	3·75	4·45	4·10	8·90	9·20	9·02	14	–
Nov. „	3·20	3·85	3·55	8·90	9·15	9·02	13	–	3·35	4·05	3·88	8·80	9·20	9·00	13	–
Dec. „	3·35	3·95	3·58	9·00	9·15	9·06	12	–	3·30	4·25	3·75	9·05	9·25	9·14	12	–
Jan. 1900	3·40	3·75	3·52	8·85	9·25	9·09	13	–	3·60	4·30	3·82	9·05	9·35	9·22	14	–
Feb. „	3·40	3·80	3·59	8·80	9·20	9·05	12	–	3·60	4·30	3·97	8·90	9·35	9·18	12	–
March „	3·30	3·80	3·62	8·95	9·15	9·02	13	–	3·60	4·50	3·93	8·95	9·20	9·10	13	–
April „	3·30	3·75	3·57	8·90	9·05	8·96	12	–	3·60	4·15	3·85	8·90	9·10	9·01	12	–
May „	3·10	3·60	3·44	8·85	9·10	9·01	20	–	3·65	4·80	4·03	8·85	9·25	9·09	20	–
June „	3·20	3·70	3·45	8·85	9·10	8·94	12	–	3·30	4·15	3·78	8·80	9·15	8·98	12	–

TABLE 1D.—FARM NO. 4.

Jan. 1899	3·25	3·95	3·62	8·90	9·15	9·02	13	–	3·85	4·85	4·17	8·90	9·25	9·15	13	–
Feb. „	3·35	3·95	3·72	8·85	9·30	9·05	16	–	3·25	4·95	3·93	8·95	9·40	9·16	16	–
March „	3·45	4·05	3·66	8·85	9·25	9·07	13	–	3·55	4·55	4·00	8·95	9·30	9·14	14	–
April „	3·35	3·85	3·65	8·80	9·15	8·98	12	–	3·35	4·95	3·95	8·80	9·25	9·02	12	–
May „	3·25	3·85	3·52	8·85	9·20	9·08	12	–	3·55	4·95	4·15	8·95	9·25	9·06	13	–
June „	3·15	3·55	3·38	8·90	9·20	8·99	10	–	3·45	4·15	3·80	8·85	9·10	8·94	11	–
July „	3·20	3·75	3·44	8·45	8·95	8·79	12	–	3·65	4·15	3·89	8·30	8·85	8-71	13	–
August „	3·25	4·15	3·67	8·40	8·85	8·67	13	–	3·35	4·65	3·92	8·40	8·80	8·59	14	–
Sept. „	3·30	4·25	3·68	8·70	9·10	8·84	13	–	3·10	4·65	4·04	8·60	9·30	8·85	13	–
Oct. „	3·10	3·95	3·47	8·85	9·15	9·01	13	–	3·65	4·45	4·11	8·80	9·25	9·03	14	–
Nov. „	3·15	3·75	3·39	8·70	9·15	8·86	13	–	3·30	4·15	3·71	8·75	9·15	8·97	13	–
Dec. „	3·25	3·60	3·42	8·80	9·10	9·00	12	–	3·35	4·15	3·75	8·85	9·40	9·19	12	–
Jan. 1900	3·20	4·05	3·40	8·85	9·20	9·00	13	–	3·55	4·00	3·73	9·00	9·25	9·16	14	–
Feb. „	3·10	3·70	3·45	8·85	9·05	8·93	12	–	3·35	4·25	3·77	8·90	9·25	9·10	12	–
March „	3·10	3·60	3·36	8·80	9·20	8·99	13	–	3·40	3·90	3·69	9·00	9·35	9·15	13	–
April „	3·05	3·75	3·30	8·80	9·15	8·93	12	–	3·25	4·15	3·69	8·90	9·20	9·05	12	–
May „	3·20	3·55	3·33	8·85	9·10	8·95	17	–	3·45	4·15	3·81	8·90	9·25	9·08	17	–
June „	3·05	3·60	3·37	8·85	9·05	8·93	12	–	3·60	4·15	3·83	8·75	9·10	8·93	12	–

TABLE 1E.—FARM No. 5.

Date.	MORNING MILK.								EVENING MILK.							
	Fat.			Solids not Fat.			Number of Samples.	Number under 3 per cent. Fat.	Fat.			Solids not Fat.			Number of Samples.	Number under 3 per cent. Fat.
	Minimum.	Maximum.	Average.	Minimum.	Maximum.	Average.			Minimum.	Maximum.	Average.	Minimum.	Maximum.	Average.		
Jan. 1899	3·35	3·85	3·62	8·70	9·25	9·01	13	–	3·55	4·45	3·97	8·70	9·50	9·01	13	–
Feb. ,,	3·35	3·95	3·61	8·80	9·25	8·99	12	–	3·35	4·95	4·01	8·90	9·25	9·05	12	–
March ,,	3·35	3·90	3·63	8·85	9·25	8·97	13	–	3·45	4·85	3·97	8·80	9·25	9·04	14	–
April ,,	3·05	3·75	3·51	8·75	9·10	8·88	12	–	3·45	4·35	3·93	8·70	9·10	8·93	12	–
May ,,	3·15	3·95	3·52	8·80	9·20	9·07	12	–	3·45	4·55	3·79	8·80	9·25	9·04	13	–
June ,,	2·95	3·85	3·34	8·90	9.15	9·01	10	1	3·55	4·65	3·89	8·85	9·05	8·97	11	–
July ,,	2·85	3·65	3·35	8·40	9·20	8·81	12	2	3·55	4·55	3·95	8·55	9·00	8·75	13	–
August ,,	3·35	4·10	3·62	8·50	8·85	8·72	13	–	3·75	4·65	4·08	8·50	8·80	8·66	14	–
Sept. ,,	3·25	4·05	3·54	8·80	9·10	8·96	12	–	3·25	4·65	4·08	8·60	9·25	8·93	13	–
Oct. ,,	3·05	3·70	3·47	8·75	9·10	8·96	13	–	3·55	4·15	3·76	8·85	9·20	8·93	14	–
Nov. ,,	3·05	3·45	3·31	8·80	9·00	8·90	18	–	3·35	4·45	3·79	8·80	9·10	8·99	13	–
Dec. ,,	2·95	4·00	3·38	8·90	9·20	9·03	12	1	3·35	3·85	3·62	8·75	9·25	9·08	12	–
Jan. 1900	3·20	3·50	3·35	8·85	9·05	8·95	13	–	3·50	3·95	3·70	8·95	9·30	9·08	14	–
Feb. ,,	3·10	3·50	3·35	8·80	9·00	8·93	12	–	3·40	4·10	3·63	8·90	9·10	9·00	12	–
March ,,	3·00	3·50	3·23	8·65	8·90	8·84	13	–	3·35	4·25	3·63	8·80	9·20	9·00	13	–
April ,,	2·90	3·30	3·15	8·75	9·05	8·91	12	1	3·35	4·05	3·59	8·80	9·10	8·94	12	–
May ,,	2·95	3·35	3·21	8·80	9·15	8·96	22	1	3·45	4·05	3·67	8·85	9·20	8·99	18	–
June ,,	2·85	3·40	3·16	8·85	9·00	8·92	12	1	3·30	4·15	3·77	8·75	9·15	8·96	12	–

TABLE 1F.—FARM No. 6.

Jan. 1899	3·45	4·00	3·71	8·90	9·20	9·04	13	–	3·65	4·50	4·10	9·05	9·35	9·26	14	–
Feb. ,,	3·50	3·95	3·72	8·95	9·50	9·13	12	–	4·00	4·65	4·30	9·00	9·45	9·21	12	–
March ,,	3·60	4·45	3·79	8·85	9·30	9·10	13	–	3·85	4·65	4·29	9·00	9·45	9·18	12	–
April ,,	3·35	3·75	3·58	8·80	9·15	9·04	12	–	3·90	4·60	4·14	9·00	9·20	9·04	12	–
May ,,	2·95	3·65	3·37	8·90	9·10	9·01	14	1	3·55	4·25	3·86	8·85	9·15	8·99	13	–
June ,,	3·05	3·50	3·27	8·75	9·05	8·92	11	–	3·35	3·95	3·67	8·80	9·05	8·92	10	–
July ,,	2·65	4·00	3·48	8·65	9·05	8·84	13	1	3·50	4·20	3·86	8·50	9·00	8·74	13	–
August ,,	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Sept. ,,	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Oct. ,,	3·15	4·55	3·67	8·80	9·45	9·07	13	–	3·65	4·85	4·13	8·90	9·35	9·07	16	–
Nov. ,,	3·25	3·90	3·55	8·85	9·20	9·06	13	–	3·55	4·55	4·09	8·85	9·30	9·09	13	–
Dec. ,,	3·15	4·05	3·49	8·90	9·15	9·06	12	–	3·65	4·30	3·96	9·00	9·35	9·14	12	–
Jan. 1900	3·10	3·70	3·45	8·90	9·15	9·05	14	–	3·65	4·25	3·98	9·05	9·30	9·16	13	–
Feb. ,,	3·25	3·75	3·49	8·90	9·15	9·03	12	–	3·60	4·30	3·95	9·00	9·30	9·11	12	–
March ,,	3·30	3·70	3·45	8·80	9·30	9·07	14	–	3·80	4·20	4·02	8·95	9·40	9·17	13	–
April ,,	3·15	3·65	3·41	8·85	9·10	9·01	11	–	3·50	4·55	4·13	9·00	9·15	9·09	12	–
May ,,	2·95	3·55	3·29	8·95	9·10	9·04	20	1	3·55	4·50	3·98	8·80	9·25	9·04	19	–
June ,,	3·20	3·75	3·45	9·00	9·10	9·06	13	–	3·70	4·05	3·88	8·85	9·10	8·97	12	–

TABLE 1G.—FARM NO. 7.

Date.	MORNING MILK.								EVENING MILK.							
	Fat.			Solids not Fat.			Number of Samples.	Number under 3 per cent. Fat.	Fat.			Solids not Fat.			Number of Samples.	Number under 3 per cent. Fat.
	Minimum.	Maximum.	Average.	Minimum.	Maximum.	Average.			Minimum.	Maximum.	Average.	Minimum.	Maximum.	Average.		
Jan. 1899	3·35	4·50	3·82	9·00	9·55	9·23	13	–	3·90	4·55	4·18	8·80	9·55	9·18	14	–
Feb. ,,	3·55	4·05	3·81	9·00	9·40	9·19	12	–	4·05	5·05	4·37	9·00	9·25	9·13	12	–
March ,,	3·35	4·05	3·71	8·95	9·35	9·14	13	–	3·85	4·65	4·25	8·90	9·25	9·05	12	–
April ,,	3·45	4·15	3·71	8·85	9·20	8·99	12	–	3·75	4·35	4·07	8·80	9·10	8·98	12	–
May ,,	2·80	3·85	3·39	8·85	9·20	9·01	14	1	3·50	4·10	3·82	8·80	9·10	8·99	13	–
June ,,	2·75	3·50	3·19	8·80	9·15	9·02	11	3	3·40	4·05	3·75	8·85	9·00	8·93	10	–
July ,,	2·55	3·70	3·36	8·75	9·10	8·87	9	1	3·45	3·95	3·69	8·65	9·00	8·82	9	–
August ,,	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Sept. ,,	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Oct. ,,	3·45	4·55	3·92	9·00	9·30	9·16	13	–	3·85	4·65	4·20	8·80	9·15	8·94	13	–
Nov. ,,	3·20	4·35	3·54	8·75	9·35	9·07	13	–	3·45	4·90	4·25	8·80	9·25	9·05	13	–
Dec. ,,	3·15	3·75	3·47	8·75	9·30	9·14	12	–	3·50	4·65	4·24	8·90	9·30	9·13	12	–
Jan. 1900	3·30	3·80	3·53	9·10	9·35	9·21	14	–	3·95	4·40	4·14	8·95	9·30	9·14	13	–
Feb. ,,	3·40	3·70	3·55	8·90	9·30	9·15	12	–	3·70	4·30	4·06	9·00	9·25	9·11	12	–
March ,,	3·20	3·50	3·34	8·80	9·30	9·07	14	–	3·40	4·35	3·83	8·95	9·25	9·12	13	–
April ,,	3·15	3·50	3·30	8·75	9·20	9·00	11	–	3·60	4·20	3·80	8·65	9·20	8·99	12	–
May ,,	2·95	3·50	3·22	8·70	9·10	8·90	22	1	3·50	4·15	3·83	8·75	9·00	8·89	17	–
June ,,	2·85	3·60	3·17	8·80	9·10	8·93	13	2	3·40	4·15	3·66	8·60	8·95	8·84	12	–

TABLE 1H.—FARM NO. 8.

Jan. 1899	3·50	4·10	3·69	8·75	9·25	9·01	13	–	3·35	4·65	4·01	8·85	9·30	9·02	14	–
Feb. ,,	3·45	4·35	3·85	8·90	9·15	9·02	12	–	2·85	4·25	3·77	8·80	9·25	9·01	12	1
March ,,	3·35	4·15	3·75	8·80	9·20	9·00	13	–	3·35	4·35	3·85	8·75	9·15	8·92	12	–
April ,,	3·35	3·85	3·59	8·80	9·15	8·95	12	–	3·10	4·35	3·83	8·80	9·15	8·92	12	–
May ,,	2·85	3·75	3·29	8·50	9·15	8·90	31	2	2·85	4·15	3·59	8·80	9·20	9·00	13	1
June ,,	2·85	3·95	3·35	8·70	9·05	8·83	12	2	3·25	4·20	3·57	8·80	9·00	8·89	11	–
July ,,	2·85	3·85	3·43	8·45	8·90	8·64	13	1	3·05	4·05	3·61	8·55	8·95	8·72	13	–
August ,,	3·25	4·05	3·52	8·40	8·85	8·58	13	–	3·20	4·10	3·69	8·40	8·70	8·54	12	–
Sept. ,,	3·35	4·25	3·75	8·50	8·85	8·67	13	–	3·75	4·70	4·20	8·50	8·90	8·73	12	–
Oct ,,	3·15	4·40	3·73	8·80	9·15	8·96	13	–	3·75	4·65	4·10	8·75	9·20	8·91	13	–
Nov. ,,	2·70	3·95	3·47	8·60	9·15	8·91	26	1	3·45	4·75	4·05	8·75	9·15	8·95	13	–
Dec. ,,	3·30	3·90	3·65	8·80	9·25	8·96	12	–	3·45	4·65	3·97	8·85	9·20	9·02	12	–
Jan. 1900	3·45	3·65	3·55	8·90	9·10	9·00	14	–	3·60	4·40	3·98	8·80	9·15	8·95	13	–
Feb. ,,	3·45	3·90	3·58	8·70	9·10	8·94	12	–	3·60	4·50	3·90	8·85	9·15	8·98	12	–
March ,,	3·30	3·80	3·52	8·85	9·10	8·97	14	–	3·60	4·20	3·87	8·75	9·20	8·94	13	–
April ,,	3·15	3·75	3·45	8·80	9·05	8·91	12	–	3·50	4·10	3·76	8·75	9·05	8·85	12	–
May ,,	2·45	3·65	3·11	8·80	9·10	8·96	44	9	3·00	3·95	3·56	8·80	9·10	8·99	26	–
June ,,	3·00	3·55	3·28	8·80	9·05	8·92	13	–	3·15	4·25	3·55	8·75	9·00	8·90	12	–

TABLE 2 A.—FARM NO. 1.

Churn No.	Fat.	Solids not Fat.
	P.M., 17th May.	
	Per Cent.	Per Cent.
1,556	3·65	9·15
1,357	3·80	9·15
490	3·60	9·10
1,365	3·45	9·10
1.202	3·55	9·05
298	3·80	9·20
870	3·25	9·10
1,153	3·65	9·05
682	3·65	9·05
1,216	3·55	9·15
1,634	3·55	9·10
621	3·55	9·00
402	3·60	9·10
	A.M., 18th May.	
1,196	3·15	9·10
1,363	3·20	9·10
686	3·15	9·10
1,214	3·45	9·10
1.114	3·15	9·10
828	3·25	9·20
95	3·50	9·15
339	3·25	9·10
1,011	3·20	9·10
910	3·30	9·10
601	3·20	9·10
1,189	3·00	9·20
1,026	3·05	9·30
55	3·15	9·10
1,334	3·30	9·10

TABLE 2 B.—FARM NO. 2.

Churn No.	Fat.	Solids not Fat.
	P.M., 17th May.	
	Per Cent.	Per Cent.
1,008	3·80	9·05
206	3·60	9·05
1,525	3·60	9·10
1,438	3·65	8.85
482	3·60	9·00
706	3·55	8·85
206	3·70	9·00
1,594	3·80	9·15
143	3·65	8·90
1.068	3·30	9·10
822	3·30	9·10
1,409	4·00	9·10
	A.M., 18th May.	
1,505	3·15	8·90
1,100	3·20	9·10
1,215	3·20	9·00
47	3·20	9·10
127	3·20	9·10
750	3·05	9·10
1,133	3·10	9·05
1,412	3·20	9·15
1,407	3·20	9·00
1,166	3·20	9·10
942	3·15	9·05
951	3·20	9·05
1,220	3·25	9·10
795	3·15	9·05

TABLE 2 C.—FARM NO. 3.

Churn No.	Fat.	Solids not Fat.
	P.M., 17th May.	
	Per Cent.	Per Cent.
236	4·05	9·10
435	4·80	9·05
193	4·15	9·20
578	4·60	9·25
24	4·35	9·10
1.142	4·00	9·00
418	3·80	9·20
774	3·80	9·15
	A.M., 18th May.	
772	3·35	9·00
918	3·40	9·10
57	3·40	9·00
237	3·60	9·05
355	3·10	8·95
191	3·50	9·05
826	3·40	9·05
99	3·50	9·10
1,431	3·35	8·85

TABLE 2 D.—FARM NO. 4.

Churn No.	Fat.	Solids not Fat.
	P.M., 17th May.	
	Per Cent.	Per Cent.
98	3·75	9·10
1,582	3·60	9·00
1,152	4·15	9·15
809	3·50	9·10
545	3·70	9·15
	A.M., 18th May.	
1,472	3·20	9·10
1.305	3·40	9·10
896	3·30	9·10
742	3·35	8·90
820	3·20	8·90
1,418	3·20	8·85

TABLE 2 E.—FARM NO. 5.

Churn No.	Fat.	Solids not Fat.
	P.M., 17th May.	
	Per Cent.	Per Cent.
363	3·75	9·00
850	3·65	9·00
332	3·55	8·95
944	3·50	8·90
1,575	3·45	8·95
904	3·45	9·00
	A.M., 18th May.	
982	3·30	9·00
394	3·35	9·10
1,426	3·15	8·95
1,459	3·10	8·95
1,562	3·30	9·15
1.565	3·35	9·10

TABLE 2 F.—FARM No. 6.

Churn No.	Fat.	Solids not Fat.
	P.M., 17th May.	
	Per Cent.	Per Cent.
64	3·55	8·95
1,310	4·45	9·15
313	4·20	9·10
185	3·85	9·90
793	4·10	8·80
719	4·00	9·05
	A.M., 18th May.	
52	3·25	9·05
429	3·30	9·05
612	3·00	9·10
536	3·00	9·05
132	3·35	9·10
695	2·95	9·00
1,299	3·00	9·05

TABLE 2 G.—FARM No. 7.

Churn No.	Fat.	Solids not Fat.
	P.M., 17th May.	
	Per Cent.	Per Cent.
290	3·60	8·75
1,178	3·60	8·85
1,099	3·80	8·90
275	3·80	8·95
	A.M., 18th May.	
804	3·25	9·00
1,181	3·30	8·85
657	3·35	8·95
1,425	3·05	8·90
233	3·20	8·70

TABLE 2 H.—FARM No. 8.

Churn No.	Fat.	Solids not Fat.
	P.M., 17th May.	
	Per Cent.	Per Cent.
946	3·55	8·85
1,092	3·40	8·80
661	3·75	8·90
1,080	3·35	9·00
81	3·75	8·90
855	3·70	8·85
324	3·50	8·90
808	3·45	8·95
1,402	3·35	9·00
1,441	3·90	9·10
1,351	3·10	9·00
640	3·30	9·00
515	3·55	9·10
	A.M., 18th May.	
1,277	3·20	9·05
1,612	3·00	9·05
969	2·45	8·80
1,460	3·30	9·05
41	3·15	8·95
1,176	3·05	9·05
1,269	3·65	8·95
1,096	3·15	8·95
1,368	3·40	8·95
1,170	3·00	8·85
1,613	3·50	9·10
100	3·45	9·00
919	3·30	8·95
770	3·20	8·90
1,415	3·15	8·95
712	2·70	9·00

TABLE No. 3.

ABSTRACT of RESULTS in TABLES III. a—d in Report of Food Products Adulteration Committee, 1894, pp. 218–221, and TABLES 4, a—f, Appendix XXIV., pp. 385–390 (herein).

Month.	Minimum Fat sent out during										Decade.		Lustrum I.		Lustrum II.		Differences in Lustra.	
	Lustrum I.					Lustrum II.												
	1890	1891	1892	1893	1894	1895	1896	1897	1898	1899	Min.	Average.	Min.	Average.	Min.	Average.	Between Minima.	Between Averages.
January	3·50	3·30	3·40	3·20	3·20	3·50	3·40	3·40	3·35	3·30	3·20	3·35	3·20	3·32	3·30	3·39	+ 0·10	+ 0·07
February	3·40	3·10	3·40	3·10	3·10	3·45	3·25	3·35	3·15	3·25	3·10	3·25	3·10	3·22	3·15	3·29	+ 0·05	+ 0·07
March	3·20	3·20	3·40	3·08	3·20	3·35	3·25	3·30	3·25	3·20	3·20	3·24	3·08	3·22	3·20	3·27	+ 0·12	+ 0·05
April	3·00	3·20	3·10	3·10	3·20	3·15	3·15	3·30	3·25	3·10	3·00	3·15	3·00	3·12	3·10	3·19	+ 0·10	+ 0·07
May	3·10	3·10	3·20	3·10	3·10	3·15	3·00	3·05	2·95	2·90	2·90	3·06	3·10	3·12	2·90	3·01	− 0·20	− 0·11
June	3·10	3·20	3·00	3·10	3·20	3·10	3·10	2·95	2·95	2·90	2·90	3·06	3·00	3·12	2·90	3·00	− 0·10	− 0·12
July	3·40	3·40	3·20	3·20	3·20	3·15	3·05	3·00	3·15	3·00	3·00	3·17	3·20	3·28	3·00	3·07	− 0·20	− 0·21
August	3·30	3·50	3·20	3·30	3·20	3·15	3·30	2·90	3·15	3·10	2·90	3·21	3·20	3·30	2·90	3·12	− 0·30	− 0·18
September	3·40	3·30	3·50	3·40	3·25	3·15	3·20	3·10	3·25	3·30	3·10	3·28	3·25	3·37	3·10	3·20	− 0·15	− 0·17
October	3·60	3·50	3·40	3·50	3·30	3·30	3·40	3·25	3·25	3·20	3·20	3·37	3·30	3·46	3·20	3·28	− 0·10	− 0·18
November	3·60	3·70	3·30	3·30	3·35	3·25	3·15	3·20	3·25	3·20	3·15	3·33	3·30	3·45	3·15	3·21	− 0·15	− 0·24
December	3·50	3·40	3·20	3·30	3·30	3·30	3·40	3·40	3·25	3·20	3·20	3·32	3·20	3·34	3·20	3·31	0·00	− 0·03

The average mentioned above is an average of minima only.

TABLE No. 4.

ABSTRACT of TABLE showing Number of Samples containing Percentage of Fat specified in Appendix XXV.

Year.	1894.	1895.	1896.	1897.	1898.	1899.
1 per cent. of the samples lie above	5·00	4·90	4·79	4·84	4·89	4·74
1 per cent. lie within 0·1 per cent. of	4·78	4·72	4·67	4·72	4·71	4·54
Equal numbers of samples lie above and below	3·79	3·77	3·73	3·76	3·76	3·66
1 per cent. lie within 0·1 per cent. of	3·04	3·06	3·03	3·04	3·01	2·98
5 per cent. lie below	3·33	3·32	3·31	3·33	3·39	3·27
1 per cent. lie below	3·04	3·11	3·07	3·05	3·01	2·97
Percentage below 3·0 per cent.	0·629	0·425	0·413	0·714	0·947	1·192

The Aylesbury Dairy Company, Limited.
Chief Office, St. Petersburgh Place,
Bayswater, London, W.
25th July 1900.

Dear Sir,

In accordance with your request, we enclose tables of the analyses of milk made during 1899 and the present year from farms in your occupation. We would point out, however, that in comparing them with the information of a similar nature with which we furnished you in 1894, to lay before the Food Products Adulteration Committee, it is necessary to bear in mind that the period now dealt with is three times as long, and the daily quantity of milk twice as great as in 1894. Comparing the same farms in 1894 and 1900 the results do not greatly differ.

In reply to your suggestion, that a change in our position with regard to standards for milk has taken place since 1894, we would draw your attention to the fact that we were then combating a proposed standard of 2·5, recommended by the Dairy Trade and Can Protection Society (Food Products Adulteration Report, 363, 2nd July 1895, pages 28 to 32 and 369 to 370). This is clearly shown by the statements in our paper handed in by the Chairman (Food Products Adulteration Report, No. 253, 1st August 1894, page 211) in which we contended that "not only is there no real justification for a lower standard than 3·0, but that it should be raised in the autumn and winter."

Since 1894 a change in the composition of milk has taken place. To make this quite clear we enclose two tables, Nos. 3 and 4, which are abstracts of tables formerly submitted, and which show in a concise form the extent to which the quality of milk has fallen during the last 10 years. Our position, therefore, now, as shown by the evidence of our Mr. Richmond before the Milk Standards Committee, is that the standard might be lowered in May and June to 2·8 or 2·9, and should be raised in the autumn and winter. The change of view since 1894 is of very slight importance seeing that it only affects a season when milk is most plentiful and at its minimum price, and when consequently adulteration is also likely to be at a minimum.

But though we think that the standard might be lowered during May and June, we are far more anxious to see it raised during the autumn and winter, and if it were a question of abandoning the raising in the winter or the lowering in May and June, we should unhesitatingly abandon the latter.

We are, Dear Sir,
Yours faithfully,
pp. The Aylesbury Dairy Company, Limited,
J. A. HATTERSLEY,
Managing Director.

S. W. Farmer, Esq.,
Little Bedwyn, Wilts.

APPENDIX No. XXXVI.

Handed in by Major CRAIGIE.

MILK CONTROL IN ROTTERDAM.

(Communication from Dr. A. Lam, of the City Laboratory for Foods, &c., at Rotterdam, to the "Zeitschrift für Untersuchung der Nahrungsmittel, &c.," July 1900.)

From the following will be seen the great importance of a regulated milk control in towns, the effect being (apart from the detection of sophistication) not only to get rid of the poorer kinds of milk as far as possible, but also to actually improve the quality of the milk supply in general.

In Rotterdam a regular official control has been in vogue since 1893, with the result that there has been a very marked improvement in the character of the milk sold.

The following table shows the number of abnormal (*beanstandeten*) samples during the period 1893–99, as well as their relative annual decrease, or in other words, the relative improvement from year to year in the character of the milk for sale.

Milk was considered abnormal (*beanstandet*) which contained less than 2·5 per cent. of fat, and less than 11·0 per cent. of total solids.

Year.	1893.	1894.	1895.	1896.	1897.	1898.	1899.
Percentage of abnormal milks - - - -	49·0	20·3	11·9	5·3	3·3	3·7	3·8
Percentage decrease in abnormal milk from year to year - - -	–	58·6	41·5	55·5	37·5	–	–

It would seem that in 1897 a constant minimum of abnormal samples appears to have been reached, but in reality the quality of the milk has continued to improve since that time. Up to 1897 the milk samples were taken (without any particular selection), wherever milk was sold, but in 1898 and 1899 the Food Inspectors were instructed to take samples principally from those places which were suspected of supplying milk either adulterated or of inferior quality. It is evident that in the latter case the percentage of doubtful milks will be greater than when the selection is made from milks of all sources without restriction. But the improvement in the quality of the milk is seen in another manner. If the adulterated or inferior milks, as the case may be, have been gradually eliminated, then the average figures for milk should have risen since 1893. This, as a matter of fact is actually the case. If, for example, we compare the percentage of milk-fat found in the months of September to December, in 1893 and 1899 respectively, we find the mean of the 150–180 monthly samples as follows:—

Year.	September.	October.	November.	December.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*
1893 -	2·34	2·40	2·67	2·69
1899 -	3·17	3·15	3·21	3·28
Increase in 1899 -	0·83	0·75	0·54	0·59

This is a really gratifying improvement in the quality of milk, the signification of which from an agricultural point of view ought not to be underrated.

If we take into consideration the fact that the daily consumption of milk in Rotterdam amounts to nearly 100,000 litres, it will be seen that in September 1899, for example, above* (8·3 gr. × 100,000) = 830 kilog. of milk fat is daily distributed more than in September, 1893. This amount of milk fat suffices to make more than 800 kilos. of butter having a value of 630 gulden (Dutch), or rather more than 1,050 marks. This daily increase in the value of the milk amounts to an annual gain of 230,000 gulden (Dutch), or 383,000 marks. The agricultural as well as the nutrient value of milk has consequently experienced a considerable increase since the year 1893, whilst the price of milk has remained the same as before.

Since 1895 milk samples have been sent to this Laboratory taken once a week from 3 to 7 different cowkeepers. The samples were taken by a Laboratory official who attended the milkings and saw that the vessels were clean, the milk thoroughly mixed, and other general precautions taken. In this manner a large number of genuine samples of the mixed milk of a great number of cows of different breeds were obtained. The examination of these samples of "Control Milk" afforded numbers which varied but slightly in the averages for each individual year. The values found were as follows:—

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* (Given that 1 litre of milk weighs on an average 1·03 kilogram.)

Year.	Specific gravity at 15° C.	Percentage of				
		Total solids.	Fat.	Solids not fat.	Fat in the solids.	Milk sugar (by Poiarimeter).
1895 - - - -	1031.3	12·10	3·50	8·60	28·9	–
1896 - - - -	1031.4	12·16	3·54	8·62	29·1	4·89
1897 - - - -	1031.4	12·25	3·64	8·61	29·7	4·97
1898 - - - -	1031.6	12·29	3·62	8·67	29·5	4·77
1899 - - - -	1031.3	12·33	3·65	8·68	29·6	4·82

Further the maximum and minimum values of individual milk samples varied but slightly in the different years, so that the above numbers may be taken as the average composition of milk in this locality.

If we compare the average monthly percentages of fat in the "Control Milk" with those found in the milk for sale, (or "Market Milk"), we shall find that the latter is considerably lower than the former. From this it must be concluded either that the "Market Milk" is adulterated to a considerable extent, or else the "Market Milk' examined is from the outset of a lower quality than the "Control Milk," or in other words, the samples of the former do not really represent the average of all the kinds of milk sold.

The latter is in fact the case. For as stated above the samples of "Market Milk" were taken from those retailers who were known to deal in milk of inferior quality. The possibility therefore still remains tha these milks may have been to a considerable extent adulterated.

In order to put this to the test, it is as well to compare the amount of fat in the "Control Milk" and the "Market Milk" in the various months of the year. Such a comparison was first instituted in September 1898, and continued to the end of 1899. The mean percentages of at are shown in the following table :—

——	Control Milk.	Market Milk.	Difference.
1898 :			
September - - - - -	3·62	3·11	0·51
October - - - - -	3·68	3·18	0·50
November - - - - -	3·69	3·21	0·48
December - - - - -	3·55	3·14	0·41
1899 :			
January - - - - -	3·55	3·13	0·42
February - - - - -	3·60	3·14	0·46
March - - - - -	3·64	3·17	0·47
April - - - - -	3·75	3·22	0·53
May - - - - -	3·70	3·14	0·56
June - - - - -	3·52	3·02	0·50
July - - - - -	3·61	3·04	0·57
August - - - - -	3·56	3·11	0·45
September - - - - -	3·77	3·17	0·60
October - - - - -	3·64	3·15	0·49
November - - - - -	3·66	3·21	0·45
December - - - - -	3·77	3·28	0·49
Mean - - - -	3·65	3·15	0·50

It will be seen from the above table that the percentages of fat in the "Control Milk" and "Market Milk" for each month are almost exactly parallel. This is brought out still better by the graphic method of curves shown below.*

On comparing the above numbers and the corresponding curves representing the amount of fat in the "Control Milk" and "Market Milk" respectively, we come to the conclusion that on the whole the lower quality of the "Market Milk" as compared with the "Control Milk" is not due to adulteration. For, if similar results follow from similar causes, then the undoubted parallelism between the fat percentage in the "Control Milk" and "Market Milk" in the separate months must be due to similar conditions. But since the possibility of adulteration of "Control Milk" is excluded, we must therefore assume that the mean composition of the "Market Milk" is not affected to any considerable extent by adulteration.

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* The diagram is omitted.

APPENDIX No. XXXVII.

Handed in by Major Craigie.

(*a*) ABSTRACT of Laws relating to Milk in the *United States of America.*

Compiled from the Fourteenth Annual Report of the Bureau of Animal Industry, U.S.A.

Connecticut.

Connecticut Agricultural Experiment Station may fix standard. *Skimmed milk.*—Skimmed milk must be plainly labelled. *Adulterated milk.*—The sale or delivery of adulterated, tainted, or diseased milk to a butter or cheese factory is prohibited.

District of Columbia.

Milk standard, 9 per cent. solids not fat, 3½ per cent. fat. Permit to sell milk must be obtained from health officer. *Skimmed milk.*—Skim-milk standard, 9·3 per cent. total solids. Must be plainly marked "Skim milk." *Adulterated milk.*—Diseased and unwholesome milk is prohibited. *Cream.*—Cream standard, 20 per cent. fat. Health officer's regulations govern dairies and sale of milk.

Georgia.

Milk standard, 3½ per cent. fat, 8½ per cent. solids not fat. *Skimmed milk.*—Skimmed milk is defined as milk below the standard. *Adulterated milk.*—The sale of adulterated, impure, or diseased milk is prohibited.

Illinois.

Cans and vehicles used in the retail trade of milk shall be marked with the dealer's name and the locality whence milk comes. *Skimmed milk.*—Skimmed milk may be sold as such, and each can or vessel shall be plainly marked "Skimmed milk." *Adulterated milk.* — The sale of adulterated or diseased milk, or its delivery to a factory, is prohibited. Adulteration after delivery to a factory is a misdemeanor. *Condensed milk.* — The addition of sugar to condensed milk is permitted.

Co-operative creameries shall give bond in the penal sum of $6,000 and keep a monthly report of their operations posted conspicuously in factory for the inspection of patrons.

Indiana.

Adulterated milk. — The sale of adulterated, diseased, &c., milk to anyone or its delivery to a factory is prohibited.

Iowa.

Milk standard, 12½ per cent. solids, 3 per cent. fat. Milk dealers in cities shall register with the dairy commissioner and receive permits from him. *Skimmed milk.*—Skimmed milk may be sold as such. *Cream.*—Standard 15 per cent. fat. *Adulterated milk.*—The sale of adulterated, unwholesome, and diseased milk, or delivery to a factory, is prohibited. Tests of milk in factories, &c., must be accurate.

Kansas.

Adulterated milk. — The sale of adulterated, skimmed, tainted, or diseased milk, or its delivery to any butter or cheese factory, is prohibited.

Kentucky.

Skimmed milk.—Skimmed milk shall not be sold with intent to defraud. *Adulterated milk.*—Adulterated milk, or milk from a diseased animal or an animal fed on "brewers' slop," &c., shall not be sold or used in the manufacture of butter or cheese.

Maine.

Milk standard, 12 per cent. solids, 3 per cent. fat. *Skimmed milk.*—Skimmed milk must not be sold as pure milk. *Adulterated milk.*—Sale of adulterated and diseased milk, and that from cows fed on distillery or brewery refuse, &c., is prohibited.

All glassware used for testing milk delivered at factories must be tested for accuracy under the direction of the director of the experiment station. Specific gravity of sulphuric acid used in testing milk or cream must be at least 1·82. Persons using the Babcock test for apportioning the value of milk or cream must hold a certificate from the superintendent of the dairy school of the State College of Agriculture.

Milk inspectors shall be appointed in towns of more than 3,000 inhabitants, and may be appointed in smaller towns. They are given special powers for making inspections, and are required to keep a record of the names and addresses of all dealers.

Maryland.

The mayor and city council of Baltimore shall make regulations for the sale, and provide by ordinance for the inspection of milk, shall provide for and fix compensation of inspectors and analysts.

Diseased, corrupted, or unwholesome milk shall not be sold.

Massachusetts.

Milk standard in April, May, June, July, and August, 12 per cent. total solids—9 per cent. solids not fat, 3 per cent. fat; in other months, 13 per cent. total solids—9·3 per cent. solids not fat, 3·7 per cent. fat. Milk dealers are registered and pedlars are licensed. *Skimmed milk.*—Skimmed milk includes that below the standard for pure milk. It must contain at least 9·3 per cent. solids not fat, and be plainly marked "Skimmed milk." *Condensed milk.*—Condensed milk must be labelled with name of manufacturer; if in hermetically sealed packages, brand and contents must be given. *Adulterated milk.*—The sale of adulterated, diseased, or poor milk or its delivery is prohibited. Convictions for selling adulterated milk are advertised in the newspapers.

Milk inspectors are appointed by the mayor and aldermen of cities and selectmen of towns. Feeding garbage to milch cows is prohibited.

Michigan.

Milk standard, 12½ per cent. total solids, 3 per cent. fat, specific gravity between 1·029 and 1·033. *Skimmed milk.*—The specific gravity of skimmed milk must be between 1·032 and 1·037. It may be sold for what it is from cans plainly labelled, "Skimmed milk." *Adulterated milk.*—The sale of adulterated, diseased, &c., milk to any person, or its delivery to a factory is prohibited; milk from sick cows or those fed on distillery refuse, &c., is forbidden.

The police commissioners of Detroit shall appoint an officer to act as milk inspector in that city; he shall inspect dairies, milk shops, &c., in Wayne county. Common councils or boards of trustees in cities and towns may appoint and fix the compensation of milk inspectors.

Minnesota.

Milk standard, 13 per cent. solids, 3½ per cent. fat. Persons receiving milk shipped by train or cars must empty the vessels before the milk is sour, and immediately clean them. *Cream.* — Cream standard, 20 per cent. fat. *Skimmed milk.*—Skimmed milk may be used for making skim cheese. Cans containing skimmed milk for sale must be plainly marked "Skimmed milk." *Adulterated milk.*—Unclean, unhealthy, adulterated, &c., milk includes that drawn from cows near the time of parturition, or fed on distillery waste, &c. (ensilage excepted); its sale or exchange or delivery to any factory, or its use for making cream or any food, is prohibited.

Milch cows shall not be kept in a crowded or unhealthy condition, nor fed on unwholesome food or any that produces impure milk.

Unless all the milk delivered is bought by a factory, none of it shall be used by the operators for themselves without the consent of the owners; such factories shall keep a detailed account of their operations, open to the inspection of patrons.

Proprietors of factories, shippers of milk, and milk sellers shall make regular detailed reports to the commissioner. Milk dealers in towns of more than 1,000 inhabitants shall annually obtain from the commissioner, at a cost of $1, a licence giving certain information regarding the conduct of their business.

Any city council may provide for the inspection of milk, dairies, and herds supplying milk for its use

Mississippi.

It is unlawful to milk the cow of another, or to confine her with intent to take her milk, without the consent of the owner.

Missouri.

All cities and towns have power to license dairies, provide for inspection, &c.

Montana.

Cows shall not be kept in insanitary places, or fed food that produces unwholesome milk.

Nebraska.

Adulterated milk. — The sale of adulterated, skimmed, diseased, or tainted milk, or its delivery to a factory, is prohibited.

Use of cream by employees of a factory, without permission of patrons, is prohibited.

Nevada.

Skimmed milk.—Skimmed milk may be sold as such. *Adulterated milk.*—The sale or exchange of adulterated milk, or milk from cows which are improperly cared for, or fed "swill" or other decomposed matter, is a misdemeanour.

Milk inspectors are appointed, and their compensation fixed by board of county commissioners They shall inspect milk sold by vendors and prosecute violations. Care of cows regulated.

New Hampshire.

Milk standard, 13 per cent. solids. It shall be sold by wine measure, and the capacity of vessels shall be marked upon them. *Skimmed milk.*—Milk from which any cream has been removed can be sold only from vessels plainly marked "skimmed milk." *Adulterated milk.*—The sale of adulterated, unwholesome, diseased, &c., milk, and that from cows fed on brewery refuse, &c., is prohibited.

The mayor and aldermen of cities and the select men of towns may appoint and fix the compensation of milk inspectors. In towns having inspectors, all milk dealers must register and obtain, at the cost of 50 cents. per year, a licence which gives full details as to the conduct of their business. Inspectors are given special powers for making inspections of milk, butter, &c., and names of persons convicted of selling adulterated milk are published.

New Jersey.

Milk standard, 12 per cent. solids. *Skimmed milk.*—Skimmed milk shall be sold only in or from cans plainly marked "Skimmed milk." In cities of the first class it is prohibited. *Adulterated milk.*—The sale of adulterated or unwholesome milk, or its delivery to a cheese factory is prohibited. It is defined as any which has been adulterated by the addition of any substance, or any from cows poorly cared for or fed unwholesome foods, or that has been exposed to infection by diseased persons, etc.

It is unlawful for any person to use a milk can belonging to another and marked with the owner's name or initials without his consent. If they are so used and found, their contents may be emptied.

Cows shall be properly cared for and fed. Milch cows kept in towns shall be registered. State dairy commissioner shall be notified when any of them are supposed to be diseased.

New Mexico.

City councils shall provide for the inspection of dairy products.

New York.

Milk standard, 12 per cent. solids, 3 per cent. fat. Pure milk is defined as sweet and unadulterated; pure cream is that taken from such milk. Milk shall not be kept in unclean vessels nor in insanitary places. All cans, &c., containing milk to be sold in counties other than where produced, must be plainly branded with name of the county of production; vehicles from which it is sold must be similarly marked. Glass bottles are excepted from the provision, but they must bear the name of the vendor. *Skimmed milk.*—Skim milk may be delivered to skim-cheese factories, and except in New York and King's counties, it may be sold as skimmed milk for use in the county where it is produced or an adjoining county. *Condensed milk.* Condensed milk must be made from pure and wholesome milk, and its proportion of milk solids shall be in quantity the equivalent of 12 per cent. of milk solids in crude milk, of which 25 per cent. shall be fat. All packages of condensed milk shall be labelled with name of manufacturer, etc. *Adulterated milk.*—Adulterated milk is defined as any below the standard, or which has been altered, or any from cows poorly cared for or fed certain unwholesome foods. Its sale, exchange, delivery to a butter or cheese factory, or use for any food is prohibited. Pure skim milk is excepted as above.

Milch cows shall not be kept in an insanitary condition nor be fed distillery waste, spoiled foods, or any food that injures milk; silage is permitted.

Unless factory operator buys all the milk delivered he shall not use any of it or its products without consent of the owners, and he must keep an account of all factory operations for the inspection of his patrons.

Ohio.

Milk standard, 12 per cent. solids, 3 per cent. fat; in May and June, 11½ per cent. solids. *Skimmed milk.*—Skimmed milk shall not be sold as pure milk, but it may be used for making skimmed cheese; cans containing it shall be plainly marked "Skimmed milk." *Condensed milk.*—Condensed milk shall be made from pure fresh milk; the proportion of milk solids shall be equivalent to 12 per cent. in crude milk, of which 25 per cent. shall be fat; package containing same shall be plainly labelled with true name, brand, and name of manufacturer. *Adulterated milk.*—The sale of adulterated, skimmed, unclean, unhealthy, etc., milk, and that from sick cows, or its delivery to a factory, is prohibited.

Milch cows shall not be kept in a cramped or unhealthy condition, nor fed unhealthy food, or food which produces unwholesome milk. Keeping a false account of milk delivered to a factory is prohibited. False brands on dairy products or their imitations are prohibited.

Oklahoma.

Adulterated milk.—Milk from a cow not in proper condition of health, or any milk adulterated by water or a deleterious substance, or coloured, shall not be sold or delivered.

Oregon.

Milk standard, 12 per cent. volume of cream, 12 per cent. solids, 3 per cent. butter fat, specific gravity of 1·035 after the cream has been removed. *Adulterated milk.*—Adulterated milk shall be plainly marked as such; it is defined as any which is below the standard, or has been altered so as to reduce its quality. Impure milk is defined as the product of cows fed unwholesome foods, or near the time of parturition; it is prohibited.

Milch cows shall be allowed 800 cubic feet of air space each, in stables; rows facing each other shall not be closer than six feet. Stables shall be ventilated and kept in a healthful condition.

Pennsylvania.

Milk standard, in cities of the second and third class, 12½ per cent. solids, 3 per cent. fat, specific gravity at 60° F. between 1·029 and 1·033. In towns of over 1,000 population, vehicles from which milk is vended shall be marked with names of vendors and locality of production; and in cities of the second class, dairies and milk depots shall be registered by the bureau of health. *Skimmed milk.*—Skimmed milk standard, in cities of the second and third class, 6 per cent. cream by volume, 2½ per cent. fat by weight, specific gravity at 60° F. between 1·032 and 1·037; milk from which any cream has been taken shall not be sold unless in a vessel plainly marked "skimmed milk." *Adulterated milk.*—The sale of adulterated, impure, or unwholesome milk is a misdemeanour. The addition of water or ice to milk is an adulteration, and milk from animals fed on distillery waste, or any substance in a state of putrefaction, or from sick or diseased cows, is declared to be impure and unwholesome. The sale of milk for human consumption, which contains boracic acid salt, salicylic acid, or other drug, is prohibited.

Councils of cities and boroughs may provide for milk inspection.

Rhode Island.

Milk standard, 12 per cent. solids, 2½ per cent. fat; shall be sold by wine measure; vessels to be sealed by the sealer of weights and measures. *Skimmed milk.*—Skimmed milk is that which has been skimmed, or is below the standard; it shall be sold only from cans plainly marked, "Skimmed milk." *Adulterated milk.*—The sale or exchange of adulterated or diseased milk, or that from diseased cattle, or cows fed on distillery refuse, &c., is prohibited.

The mayor and aldermen of any city and the council of any town may elect and fix the compensation of milk inspectors. In Providence this is compulsory. Inspectors may appoint collectors of samples. All persons engaged in selling milk must register with the inspectors and have their names on their wagons, &c. Names of persons convicted are published.

South Carolina.

Milk standard, 3 per cent. fat, 8½ per cent. other solids. *Skimmed milk.*—Skimmed milk is that below the standard; it and buttermilk may be sold under their own name. *Adulterated milk.*—The sale of unclean, diseased, adulterated, &c., milk, or its delivery for domestic use, or to be converted into any human food, is prohibited.

South Dakota.

Adulterated milk.—The sale of unwholesome, diseased, or adulterated milk as the pure article is prohibited.

UTAH.

Adulterated milk. — The sale or exchange of unclean, impure, &c., milk, or its use for making any kind of food, is prohibited.

VERMONT.

Milk standards, 12½ per cent. solids, 9¼ per cent. solids not fat; in May and June, 12 per cent. total solids. Standard measure is wine measure. *Adulterated milk.*—The sale of adulterated or skim milk, or milk below the standard, or its delivery to a factory, or the delivery of tainted milk to a factory, is prohibited.

Payment for milk at factories is to be based on milk testing 4 per cent. fat. Results of analysis by State Agricultural Experiment Station shall be deemed competent evidence in prosecutions. Operators of factories shall not use any cream from the milk delivered to them, except with consent of owners.

VIRGINIA.

Adulterated milk. — The sale of adulterated, skimmed, tainted, &c., milk, or its delivery to any creamery or cheese-factory, is prohibited.

Factory employees shall not use cream without the consent of its owners.

WASHINGTON.

Milk standard, 3 per cent. fat, 8 per cent. solids not fat. *Adulterated milk.*—Adulterated, skimmed, diseased, impure, &c., milk is defined as any below the standard, or which has been altered in any way, or is from cows diseased, poorly cared for, or fed unwholesome foods, or has been exposed to infection by disease germs, or has borax or salicylic acid added to it to prevent souring, &c. It shall not be sold as pure milk.

WEST VIRGINIA.

Skimmed milk.—Skimmed milk may be used in the manufacture of cheese.

WISCONSIN.

Milk standard, 3 per cent. fat and pure. Milk for city trade must be produced from healthy cows fed wholesome food. Barns, stables, &c., must be clean. *Adulterated milk.*—The sale of adulterated, diseased, &c. milk, or its delivery to a factory is prohibited. Boracic and salicylic acids and injurious antiseptics are prohibited. Standard tests may be made for proving adulteration.

Wholesome food shall be fed to cows producing milk for retail trade.

NOTE.—There are no laws relating to milk in Alabama, Arizona, Arkansas, California, Colorado, Delaware, Florida, Idaho, Louisiana, North Carolina, Tennesse, Texas, and Wyoming.

(*b*) SUMMARY of STANDARDS for MILK.

(From the Year Book of the U.S. Department of Agriculture, 1899.)

STATES.	MILK.			SKIM-MILK.	CREAM.
	Total Solids.	Solids not fat.	Fat.	Total Solids.	Fat.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
District of Columbia	—	9	3·5	9·3	20
Georgia	—	8·5	3·5	—	—
Illinois*	12	—	3	—	15
Indiana	—	9	3	—	—
Iowa	12·5	—	3	—	15
Maine	12	—	3	—	—
Massachusetts	13	9·3	3·7	9·3	—
April—September	12	9	3	—	—
Michigan	12·5	—	3	—	—
	Sp. grav. 1·029–33.	—	—	Sp. grav. 1·032–37.	—
Minnesota	13	—	3·5	—	20
New Hampshire	13	—	—	—	—
New Jersey	12	—	—	—	—
New York †	12	—	3	—	—
North Dakota	12	—	3	—	15
Ohio †	12	—	3	!	—
May and June	11·5	—	—	—	—
Oregon	12	—	3 12 per cent. cream by volume.	Sp. grav. 1·035.	—
Pennsylvania (Milk and skim-milk standards refer to cities of 2nd and 3rd class.)	12·5 Sp. grav. 1·029–33.	—	3	2·5 per cent. fat, 6 per cent. cream by volume. Sp. grav. 1·032–37.	—
Rhode Island	12	—	2·5	—	—
South Carolina	—	8·5	—	—	—
Utah	—	—	—	9 per cent. solids not fat.	—
Vermont	12·5	9·25	—	—	—
May and June	12	—	—	—	—
Washington	—	8	3	—	—
Wisconsin	—	—	3	—	—

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* In Illinois, condensed milk shall be made from milk containing at least the legal standard of 3 per cent. butter fat, and evaporated to one-third or less of its original volume.

† In New York and Ohio the milk solids of condensed milk shall be in quantity the equivalent of 12 per cent. of milk solids in crude milk, of which solids 25 per cent. shall be fat.

States not named have no laws prescribing standards for dairy products.

APPENDIX No. XXXVIII.

Handed in by Major Craigie

CARRIAGE OF MILK BY RAIL.

Copy of Correspondence between the Board of Agriculture, the Board of Trade, and the Railway Companies Association.

I.

From Assistant Secretary, Board of Agriculture, to Assistant Secretary (Railway Department), Board of Trade.

20th May, 1899.

Sir,—I am directed by the Board of Agriculture to state, for the information of the Board of Trade, that, in the course of the proceedings on the Sale of Food and Drugs Bill, it has been represented that considerable hardship arises by reason of the prosecution of milk producers in cases in which milk is proved to have been pure when handed over to a railway company for conveyance to the consignee, but is found upon arrival at the station of destination to have been adulterated.

The Board are informed that, except in cases in which rates in excess of those usually charged for the conveyance of milk are paid, it is the practice of the railway companies to require that milk-churns delivered to them for conveyance by rail should be unlocked, and the consignor is therefore unable to take any precautions to prevent persons, whether in the employ of the company or not, from having access to or from tampering with the milk while it is in the charge of the company, although he still remains liable to prosecution should the milk be adulterated in transit. . . . . . .

The Board desire me therefore to invite the observations of the Board of Trade on the subject, and to inquire whether in their judgment it would be feasible to provide any remedy for the complaints referred to.

I am, etc.,
(Signed) P. G. Craigie.

II.

From Assistant Secretary (Railway Department), Board of Trade, to Secretary, Board of Agriculture.

17th October, 1899.

Sir,—Adverting to your letter of the 20th May last with reference to the regulations of railway companies respecting the conveyance of milk, and to the question of the liability to prosecution in the event of milk being adulterated in transit, I am directed by the Board of Trade to transmit herewith for the information of the Board of Agriculture a copy of a letter which has been received from the Railway Companies' Association on the subject.

I am, etc.,
(Signed) Francis J. S. Hopwood.

Enclosure.

From Railway Companies' Association, King's Cross Station, to Assistant Secretary (Railway Department), Board of Trade.

October 12th, 1899.

Sir,—With reference to your communication (No. R. 7,352) of the 29th May last, enclosing a copy of a letter dated 20th May from the Board of Agriculture, with regard to the regulations of the railway companies for the conveyance of milk, and to the question of the liability to prosecution in the event of the milk being adulterated in transit: The railway companies have considered the question, and I am requested to inform you with reference to the statement made in the letter from the Board of Agriculture, that senders have for a long time been allowed to send milk in sealed cans, the companies accept the declaration of the senders as to the quantity conveyed, no extra charge being made; the only condition the companies require to be fulfilled is that the tare weight of the cans shall be stamped upon the outside of the can, so that in case of doubt the quantity of milk within the churn can be approximately ascertained by allowing $10\frac{1}{4}$lbs. for each gallon of milk declared.

It does not appear to the companies that there is any difficulty in the senders protecting themselves against alleged loss of milk in transit by sealing, padlocking, or otherwise fastening their cans.

I am, etc.,
(Signed) H. Oakley.

III.

From Assistant Secretary, Board of Agriculture, to Assistant Secretary (Railway Department), Board of Trade.

9th November, 1899.

Sir,—Adverting to Mr. Hopwood's letter of the 17th ult. (R. 12,901), and to the enclosure from Sir Henry Oakley on behalf of the Railway Companies' Association, I am directed by the Board of Agriculture to inquire whether they may understand from Sir Henry Oakley's letter that sealed or padlocked milk cans are, as a matter of fact, conveyed by the railway companies at the *reduced* milk rate (at owner's risk), provided that they are stamped with the tare weight of the cans, and that Section 8 of the Companies' Conditions of Carriage does not apply to such cans.

With reference to the concluding sentence of Sir Henry Oakley's letter, viz., that it does not appear to the companies that there is any difficulty in the senders protecting themselves against alleged loss of milk in transit by sealing, padlocking, or otherwise fastening their cans, I am to point out that the published conditions of the Great Northern Railway contain no provision relating to sealed cans, but, on the contrary, state specifically (Section 8) that the company shall have power to open any cans, a condition that appears to preclude their being securely fastened.

I am, etc.,
(Signed) P. G. Craigie.

IV.

From Assistant Secretary (Railway Department), Board of Trade, to Secretary, Board of Agriculture.

24th November, 1899.

Sir,—With reference to Major Craigie's letter of the 9th instant respecting the conveyance of milk by railway companies, I am directed by the Board of Trade to transmit herewith, for the information of the Board of Agriculture, a copy of correspondence which has since taken place between the Railway Companies' Association and the Board of Trade on the subject.

I am, etc.,
(Signed) T. H. W. Pelham.

Enclosure No. 1.

From Railway Companies' Association to Assistant Secretary (Railway Department), Board of Trade.

November 15th, 1899.

Sir,—With reference to your letter (No. R. 13,936) of the 14th instant and the communication from Mr. Craigie which accompanied it, respecting the regulations of the railway companies for the conveyance of milk, and the question of liability to prosecution in the event of milk being adulterated in transit, I made enquiry before I replied to your letter dated May 20th, and was informed that, as a matter of fact, the railway companies did convey milk in sealed cans, provided they were stamped as required by Clause No. 4 of the railway companies' regulations.

With regard to Clause No. 8 of the regulations, the meaning is obvious that if there are reasonable grounds for believing that a can contains a greater quantity of milk than that invoiced, the companies in such cases reserve to themselves power to open the can to ascertain that the quantity therein contained agrees with the quantity declared. It is simply a protective clause there is no reason to exercise if the milk be honestly declared.

I am, etc.,
(Signed) H. OAKLEY.

ENCLOSURE No. 2.

From Assistant Secretary (Railway Department), Board of Trade, to Railway Companies' Association.

20th November, 1899.

Sir,—I am directed by the Board of Trade to acknowledge the receipt of your letter of the 15th instant, in reply to the letter from the Board of Agriculture of the 9th instant, respecting the regulations of the railway companies for the conveyance of milk.

I am to state with reference to the first paragraph of your letter that the Board of Agriculture also appear to wish to know if any difference is made in the rates charged for the conveyance of milk when the milk is sent in sealed or padlocked cans.

With regard to the second paragraph, I am to enquire if the Board of Agriculture are to understand that the companies reserve to themselves power to open sealed or padlocked cans, though according to your letter of the 12th ultimo when the tare weight is stamped upon the outside of the can the quantity of milk inside could, in case of doubt, be approximately ascertained by allowing 10¼lbs. for each gallon of milk declared.

I am, etc.,
(Signed) FRANCIS J. S. HOPWOOD.

ENCLOSURE No. 3.

From Railway Companies' Association to Assistant Secretary (Railway Department), Board of Trade.

November 21st, 1899.

Sir,—I am in receipt of your letter of the 20th instant (No. R. 14,232) respecting the communication from the Board of Agriculture on the subject of the regulations of the railway companies for the conveyance of milk. I am informed by all the principal railway companies that they do not make any difference in the charges when sealed cans are used.

The companies *do* reserve the right to open locked cans when there is any reasonable doubt as to the accuracy of the consignment.

I am, etc.,
(Signed) H. OAKLEY.

INDEX TO EVIDENCE.

A.

ABNORMAL MILK.—Dyer, 354-8, 371; Stirling, 1869-72; Cameron, 2499; Speir, 2875; Curtis-Hayward, 4186; Hoskins, 5239; Lloyd, 5970-8; Thwaite, 6904-9; Lewin, 10696.

ADAMS, GEORGE (7906-8051).—Farms 4,000 acres in Berkshire, and keeps 500 cows (7906-9). Thinks the standard might be fixed at 3 per cent. fat and 9 per cent. solids, not fat, for March, April, May and June, and 3·25 and 9·25 for the other eight months (7912-24). Suggests that churns in which separated milk is sent to London should be marked with one inch letters "separated milk," or painted red (7925-7). Samples of milk should be taken at the departure, not the arrival, station (7932-43). The spring is the best time for cows to calve; if they calve during the hot weather there are losses from milk fever. London wants more milk in May and June than at any other time of year. Milks before six in the morning and after three in the afternoon, keeping as regular as possible (7956-63). Sells his milk under a contract which stipulates for 3·25 per cent. fat all the year round, and has had no complaint during the last 12 months, or been deducted for quality in his life (7981-5, 8029-41).

ADULTERATION OF MILK, PREVALENCE OF.—Hill, 23-8; Dyer, 392, 430-4; De Hailes, 585-7, 667-74; Ashby, 1441-7; Cameron, 2411, 2449-53, 2507, 2610-15; Bowler, 3317-23; Fisher, 3770-3; Allen, 4483-5, 4551; Macdougald, 4908-11, 4973-4; King, 5381-3; Lloyd, 5916-30, 6081-2, 6134-60; Steel, 6272; Drinkwater, 9213-15; Niven, 9606-9, 9732-4; Brown, 9865-70, 9888-9, 9962-7.

ADULTERATION OF MILK BY FARMERS.—Hill, 30, 38, 102; Carrick, 1151; Gates, 1165; Cameron, 2589; Speir, 2518-9; Furney, 3239-40; Chalmers, 3409, 3421, 3641-2; Pearce, 5109-17, 5131-8; Ralston, 5724, 5829-32; Steel, 6276-81, 6302-39, 6399-6412; Stratton, 6561-2; Thwaite, 6838-9; Walker, 7561-8; Niven, 9608-9, 9632-51; Maskelyne, 9976, 10080.

ADULTERATION OF MILK, BY DEALERS.—Hill, 28, 38, 101; Carrick, 1149; Cameron, 2507-9, 2588, 2601-9; Speir, 2841-5; Chalmers, 3410-1, 3421-4, 3497, 3641-2; Curtis-Hayward, 4207; Allen, 4506-8; King, 5464-7; Steel, 6418-31; Grigg, 6618, 6697; Drinkwater, 9451-6; Niven, 9618-22.

ADULTERATION OF MILK, IN TRANSIT.—Hill, 66-7, 106-11, 137-56, 310-11; Ralston, 5820; Prideaux, 7285-7300; Adams, 7934-9, 7990-7; Maskelyne, 10084.

ALBUMINOIDS IN MILK.—Hill, 51-3; Fisher, 4079-97; Allen, 4553-63, 4697-4713; King, 5438-45; Lloyd, 6211-9; Richmond, 8595-8602; Bevan, 8975-85; Drinkwater, 9208-11.

ALLEN, A. H. (4473-4818).—Is Public Analyst for Sheffield, West Riding, etc. (4474). Adulteration Acts are fairly worked in Sheffield and West Riding with regard to milk. There is a good deal of adulteration. Does not think milks submitted to him represent suspicious samples, as inspectors are probably less likely to get adulterated samples than an ordinary purchaser (4479-85). Describes method of analysis. Would object to be compelled to use particular methods, and claims independence of action so long as his results are accurate. If any regulation fixing methods of analysis were intended it should be the result of careful conference between the head of the Government Laboratory and certain typical public analysts. It might be advisable to prohibit the use of certain methods (4486-4505). The limit of 3 per cent. of fat allows a certain amount of adulteration. It is a common practice in Sheffield for milk distributors to mix separated milk with whole milk (4506-8). Thinks the standard might be raised to 3·2 or 3·25 per cent. of fat without injustice. This would practically mean a working limit of 3, as no discreet analyst will give a certificate on which proceedings can be taken if the milk nearly approaches the limit, so that 3 per cent. is in practice 2·6 or 2·7. In fixing limits it must be taken into account that they can never be worked up to (4509). Considers Section 4 of the Food and Drugs Act, 1899, to be a dead letter, as lawyers will not go into Court on a certificate of only a "presumption" that milk is not genuine. Had not, however, considered Section 3, Sub-section 2, of the Act as applying, and this would very likely meet the case (4511-28). The adulterator, in the provinces at least, always appears to have the sympathy of the public, and the inspectors are not popular (4528). Hand-skimmed milk contains over 1 per cent., and machine-skimmed milk not more than 0·3 per cent. of fat (4532-45). The amount of non-fatty solids gives the analyst the best general criterion of the presence and amount of added water in milk. In cases of prosecution he also determines the ash and sometimes also the nitrogen. Thinks that Section 4 of the new Act modifies the position of the analyst, and perhaps the form of certificate (4546-58). All is not milk that comes from the cow, and there should be a limit below which no excuse as to the natural character of the milk should be permitted (4571-5). Does not think it possible to have standards varying by locality or season (4576-82). The recent raising of the Government Laboratory standard enables analysts to work more closely and with advantage to the public (4595). Does not use the Adams method of analysis except in the way of a standard; prefers the Werner-Schmidt (4602). Does not now generally report the actual figures of his analyses when the sample is found to be genuine (4630-5). Complains that no official intimation is given by the Government Laboratory when the standard is changed (4636-60). Would prefer a standard of fat and non-fatty solids separately, to one of total solids. Would regard 3 per cent. of fat as an absolute minimum, but would not say that a perfectly proper milk might not fall below 12 per cent. total solids. With 12 per cent. total solids there should be more than 3 per cent. of fat—certainly 3·25 (4687-96). The standard of fat in condensed milk might be fixed by the proteids—it should contain at least as much fat as proteids (4728). For skim milk suggests a standard of 0·8 per cent. of fat, and all skim milk if not expressly described as machine-separated should come under this standard (4807).

ANALYSIS, METHODS OF.—*See* Methods of Analysis.

ANALYSTS, DISCRETION OF.—Hill, 230; Dyer, 396; De Hailes, 644-6, 776-81; Carrick, 1058-9; Pocock, 1294, 1312; Ashby, 1473, 1509-11; Cameron, 2496-8; Fisher, 3752-68, 3802-10, 3827-9, 4010-31; Allen, 4509-10, 4616-25, 4714-22, 4738-46, 4781-3; King, 5446-54; Lloyd, 6178-87, 6222-31; Thwaite, 6975-92; Bevan, 8957-62, 8982; Cassal, 9080-9114; Niven, 9762-72.

ANALYSTS, DIFFERENCES IN RESULTS BY.—Stirling, 1713-1774, 1829-55; Kennedy, 2059-62; Cameron, 2436-47; Allen, 4743; Macdougald, 4864-5, 5025-60; Richmond, 8401-5, 8433-45, 8674-7; Lewin, 10613.

APPEAL TO THE COW.—Hill, 280, 314-18; Dyer, 364-5; Beecroft, 824-6, 898-9, 936-8; Carrick, 1008-12; Middleton, 2289; Speir, 2701-17, 2933-55, 2989-94; McConnell, 3062-5; Furney, 3193; Bowler, 3317, 3335-45; Curtis-Hayward, 4223-6; King, 5634-6; Stratton, 6501-14; Thwaite, 6848-52; Hoddinott, 7719-28, 7832-6; Long, 8099-8108, 8197-8210, 8263-91; Drinkwater, 9469-74; Niven, 9577-88, 9689-9707, 9742-58.

ASH OF MILK.—Hill, 51-3; Dyer, 356, 398-9; Fisher, 4065-97; Allen, 4553, 4708-13; King, 5438-45; Lloyd, 6219-21; Richmond, 8595-8602; Bevan, 8975-85.

ASHCROFT, WILLIAM (7482-7552).—Represents the British Dairy Farmers' Association (7482-4). There are times when ordinary cows would fall below even a moderate standard. Discrepancy between morning and evening milk accentuated by uneven times of milking, say 16 and 8 hours' intervals, which are very common, and in the suburbs necessitated by requirements of trade. Instance of herd of 60 cows highly fed—morning's milk

3·45 per cent. fat, evening's 4·97. Instance of similar herd where milking is at 12 hours' interval—morning's milk 3·30, evening's 3·62. Instances of variations in quality of milk tested on the same day, or within a short period (7485-93). There would be great difficulty in administering even such a low standard as 3 per cent. unless the whole milk trade were revolutionised. It cannot be reasonably expected that the cows will give the same results four or five days afterwards. Would not be content, as a consumer, to receive milk showing only 3 per cent. fat, but occasionally genuine milk may fall below it. Would leave matters as they are, and not legally flaunt a 3 per cent. standard in the face of the public. Thinks it would lead to a great deal of "toning down" (7494-7515). There is no consensus of opinion on the part of the British Dairy Farmers' Association, some members being much in favour of a standard (7524-7). Would suggest two standards for cream—the lower being that it should contain at least 20 per cent. of butter-fat (7532-8). Instances of difference in samples of milk taken when sent out for sale, and in the course of delivery (7550-2).

Ashby, Dr. Alfred (1432-1709).—Is the Medical Officer of Health for Reading and Wokingham, and Public Analyst for Reading, etc. Represents the Society of Medical Officers of Health (1433-5). His Society considers standard should be reasonably high, and based on composition of mixed dairy milk. Supports standard of 11·5 per cent. total solids, viz., 3 fat and 8·5 solids not fat. An official standard should be based on an official method of analysis. Submits results of analyses of milk in course of delivery from farmers to milk purveyors (1436-7 and Appendix No. VI.) About 8 per cent. of samples of milk in his district prove to be adulterated (1441-2). Thinks there would be no difficulty in keeping up to suggested standard (1448-50). Milk may naturally vary, according to season, by 0·5 of fat, and similarly as between morning and evening milking (1457-60). Thinks suggested standard low, and would like to go higher (1471-3). Does not believe very much in the analysis of sour milk, but does not know that the possibility of getting the same results as with fresh milk has been set out (1485-99). Does not think it possible to vary the standard according to seasons of the year, but think special circumstances should be considered in applying it (1509-11). No difficulty even in time of drought in obtaining 3 per cent. of fat (1530-1). Milk can be improved if necessary by keeping better cows, but cannot say how many cows are necessary, nor how long such a process of improvement would take (1557-63). Farmers should test their milk frequently if they have any doubt about it (1578-82). The standard of the Society of Public Analysts has been 3 per cent. for many years (1614-5). If a farmer has cows giving milk below standard he must use ordinary precautions so that the milk is mixed (1633-44). In times of drought and heat there is difficulty in keeping up the percentage of fat (1647). Explains his views as to analysis of sour milk (1656-1702).

B.

Babcock Test.—Carrick, 1090-4; Gates, 1161, 1195; Ashby, 1579; Hoskins, 5239; Ralston, 5673, 5717-23, 5741-7, 5767-75, 5850-3; Prideaux, 7262, 7415-7; Richmond, 8509; Lewin, 10568, 10570.

Beecroft, Joseph (797-966).—A dairy farmer in Cheshire (797-9). Represents Cheshire Milk Producers' Association (881-6). Desirable to fix a standard, but it should not be too high, because it would then act unfairly on farmers of indifferent land, and on account of natural variations in milk from several causes (801-8). Returns of standard demanded in 16 different towns show that majority adopt 2·75 per cent. of fat, and thinks that quite high enough (813-5). Thinks the average difference between morning and evening milk would be 1 per cent., but it might be only half per cent. (849-51). Considers a variation of standard by different analysts is very objectionable (857-9). Thinks milk over 3 per cent. going into dairymen's hands gets tampered with, and if this is to be done at all the producer has most right to do it (867-71). Thinks 2·75 would be about fair, but does not arbitrarily fix figure provided it is fixed after consideration of conditions of all classes of land (968). Addition of preservatives to cream should be prohibited (873-9). Milk which would pass in some towns will not pass in others (887-95). Has used a Dutch bull in his herd (899-902). No difficulty on good land with healthy well-fed stock in producing 3 per cent. of fat, but a hardship to compel a farmer to produce this on poor land by extra expenditure in feeding stuffs (907). He should have a chance before conviction of considering his position (908-13).

Bevan, E. J. (8909-9010).—Is honorary secretary of the Society of Public Analysts, and comes forward to represent the views of the minority of the Council, who are in favour of advocating a higher standard of fat than that hitherto adopted by the Society. They suggest the raising of the standard for fat from 3 to 3¼ per cent. (8909-17). Submits results of analysis of all samples of milk received during May and June in the four years 1896-9. Out of 805 samples there were 8 below 2·5, 26 varied from 2·5 to 2·75, and 85 from 2·75 to 3 per cent. of fat. 213 samples, or 26·4 per cent. of the whole, were notably below 3·25 per cent. fat. The average percentage of fat was in 1896, 3·41, in 1897, 3·36, in 1898 3·52, in 1899 3·71, and the mean for all the years was 3·54 (8917-25). Suggests a standard of 3·25 per cent. fat all the year round, and does not think there would be the slightest hardship to any vendor (8928). Does not use the Adams' method of analysis himself, but the Werner-Schmidt (8932-7). Thinks the general feeling of the members of the Society would be in favour of a higher standard than 3 per cent. This was fair under the old Act, and as the new Act is more elastic, considers it only logical to raise the standard (8952-6). Prefers a double standard for fat and solids not fat separately to an inclusive one of total solids, but there is no strong feeling on this point. Would not approve of the addition of figures as to nitrogen and ash on the certificate (8969-86). Thinks the idea of "ear-marking" separated milk by the addition of starch in some form is an excellent one (8995). A standard of solids might be desirable for separated milk, and would suggest 9 per cent. (8997-9002).

Bowler, William (3307-3373).—Represents the Manchester and Salford Milk Dealers' Association (3307-14). They think decidedly a standard should be fixed, and that it should be 2·75 per cent. fat and 8·75 non-fatty solids (3314-7). Describes system adopted in Manchester of taking samples of milk; proportion of adulterated samples has fallen from 35 to 9½ per cent. since 1881 (3317-23). Morning milk this month does not reach 3 per cent. of fat, while evening milk is invariably over 3 per cent. (3326). The doubtful time with milk is during March, April and May (3343). The standard he suggests is based on analyses made by the Wanklyn method, and it is possible this may affect comparison with other standards, based on other methods (3351-71).

Brown, Sir George, C.B. (9812-9969).—Milk from a perfectly healthy, well-kept cow contained only 2·5 per cent. of fat. There is no evidence that for food purposes 4 per cent. of fat is better than 3 or 2·5. Does not suggest 2·5 as a standard, because the possessors of cows giving over 4 per cent. would water down their milk. Thinks something like 3·5 per cent. of fat would be a reasonable standard to fix, and would take in perhaps the larger proportion of animals kept specially for the sale of milk. But sees no alternative but to fix at least two standards. The normal constituents of genuine milk would be 3·50 per cent. fat, and say 9 per cent. solids not fat (9812-36). Does not think it necessary to fix a standard for cream. As regards condensed milk, the proper course would be to insist on a distinct statement of its composition. For separated milk a standard of, say, 8 or 9 per cent. total solids might be adopted (9837-54). Thinks most distinctly it is not desirable for the Board to make regulations fixing a standard or standards (9855-65). Describes experiments made with the object of seeing whether it was possible to add foreign fat to milk. It is easy to do so either before or after the milk is drawn from the cow, and it is very difficult to detect (9865-9870). Food has little effect on milk. Beyond a certain normal state of fat it is almost impossible to increase it by any manner of feeding (9881-3). Describes an experiment made with the view of adding

cream to the milk in the udder (9384-7). Would strongly object to the addition of any chemical agent to milk, separated or otherwise (9890-3). The difference in the amount of fat in hand-skimmed and separated milk is considerable, and they should be sold as what they are (9924-30). Believes there is a good deal of adulteration of milk now, and doubts if the fixing of a standard would prevent it (9952-7).

Butter-yield of Milk.—Drysdale, 4315-6; Prideaux, 7362-75; Long, 8079-81, 8188-92.

C.

Cameron, Sir C. A. (2405-2657).—Is Public Analyst for Dublin, etc. (2405-8). Early in 1853 adopted a standard of 12 per cent. total solids. Investigation of milk of 42 cows at Glasnevin, with the view of determining influence of age of cows on quality of milk, difference between morning and evening milk and influence of period of lactation (2411 and Appendix No. IX). There is little doubt that milk containing less than 11.5 per cent. total solids is watered or skimmed. Suggests two standards, one of 2·7 per cent. fat and 8·5 solids not fat, and a general standard of 3 per cent. fat and 9 solids not fat. There should be no defence for milk falling below the lower standard, on the ground of its natural poverty. Has analysed about 100,000 samples of milk, and is satisfied that milk of Dublin dairy herds contains 13 to 15 per cent. of solids. These cows are kept part of the year in Dublin and part on pastures outside the city, and their milk is better when they are in the city (2411-14). Describes method of analysis (2415). Recently further experiments were made at Glasnevin with the view of determining the effect of different foods on milk-production. Certain results submitted, but only the beginning of a long series, and does not, therefore, deduce any conclusions from them (2415-17). An innocent person charged with adulterating milk is in a much better position to prove his innocence under the Act of 1899 than he was previously (2418-28). The establishment of a standard might lead to the watering down of the higher qualities of milk in a very limited number of cases. Raising the standard would under this be less likely (2449-53). It is stated that the raising of the standard of the Society of Public Analysts from 2.75 to 3 per cent. of fat was only due to improved method of analysis, but this only an opinion. Twenty years ago he obtained more fat in milk analysis than now (2455-70). The difference between morning and evening milk was greater in the 1899 experiments at Glasnevin than in those of 1880 (2474-84). Adopted standard of Somerset House, and would gladly follow if it were raised (2498-93). Has found milk with 13 per cent. total solids, and could not judge it on standard of 8.5 non-fatty solids, as he did not believe it adulterated. Has never found a sample of separated milk with more than 10·5 per cent. total solids (2501-3). About 7 or 8 per cent. of the samples of milk taken in Dublin are adulterated. The mixture of separated milk with fresh milk is practised in Dublin. This cannot be certified by analysis, but it is shown when the milk "breaks" or "cracks" on being heated (2506-9). A standard for condensed milk desirable, and it should be compulsory to state the quantity of fresh milk to which it corresponds (2511-24). Thinks cream should not contain more than 50 per cent. of water (2525-8). Would fix a standard of 9 per cent. solids for separated or skimmed milk, and would not distinguish between them (2529-33). The difference between morning and evening milk is something over one per cent. of fat (2559). The intervals of milking at Glasnevin are 8 and 16 hours (2572-5). The average of milk, good, bad, and indifferent is 3·5 per cent. of fat, so that to fix a standard of 3·25 would be dangerously near the average (2582). When he began the examination of milk in Dublin 50 to 80 per cent. of adulteration was common. Since the second Food and Drugs Act passed there has been immense improvement in the quality of milk (2610). Has no faith in analysis of milk that has been kept several weeks. Methods of analysing sour milk discussed (2620-57).

Carrick, Thomas (967-1154).—Is a county alderman and J.P. for Northumberland, and proprietor of a creamery in Cumberland (967-74). Buys milk according to a test of quality (975-8). Variation of quality from 2·75 to 4·5 per cent. of fat. Most desirable to have a reasonable standard fixed, and suggests 3 per cent. fat. At present magistrates adopt different standards, and this is most undesirable (980-1). A standard of 3 per cent. would not touch any of his supplies. Found one farm sending milk at 2·75, and immediately stopped the supply (986-90). A well-managed herd in any part of the country could easily work up to a 3 per cent. standard (993). Average of whole supplies to creamery—about 65 senders—was, in June, 3·34, and in July 3·26 of fat. Latter was the lowest in the year (999-1005). Suggests in all cases before prosecution a sample should be taken from the herd, not more than a week after taking the first sample. If the appeal to the herd did not corroborate, the benefit of the doubt should be given to the farmer (1009-12). Makes two classes of cream—single and double. Single has about 25 and double cream 56·5 per cent. of butter fat (1016). Addition of gelatin to cream is not necessary, and should be prohibited (1018-22). In milk-selling business makes three different standards at different times of the year, highest being 3·75 and lowest 3 per cent. of fat (1032-7). With a standard fixed at 2·75 there would be adulteration (1052). Has used the Babcock test, but prefers the Gerber (1090-1). Suggests a standard for cream, fixing 20 per cent. of fat as the minimum (1108-11). Formerly sent milk by rail in locked cans, but does not now do so on account of difficulty in getting suitable locks (1133-43). Thinks that as a vendor of milk he suffers from competition of milk adulterated with separated milk (1145-50). Does not think adulteration occurs on the farm (1151-2).

Carruthers, H. (2658-2692).—Represents the Liverpool and District Dairymen's Association, and is a wholesale dairyman and creamery proprietor (2658-9). Milk is liable to great variations from accidental causes (2660). Suggests a standard of 2·75 per cent. of fat. The present standard in Liverpool is 3 per cent., but there is difficulty in keeping up to it, though there are few prosecutions (2662-79). The loss of fat in distribution of milk is a great trouble to the trade (2682). Instance of prosecution for selling milk containing 2·66 per cent. fat (2684). Has never had difficulty in getting over 3 per cent. fat in milk from Cheshire (2690-2).

Cassal, C.E. (9011-9114).—Is public analyst for Kensington, St. George's, Hanover Square, etc. (9011-4). On behalf of the Vestry of Kensington suggests a standard of 3 per cent. fat and 8.5 solids not fat. They think those limits are low, but do not see their way to recommend any higher. Personally he considers that the standard might be fixed at 3·2 or 3·25 per cent. fat, and 8·5 non-fatty solids (9015-9021). Considers no article should be sold as cream which does not contain at least 25 per cent. of milk fat. As regards condensed milk, the extent of condensation may be most conveniently determined by the percentage of ash. Where it contains 2 to 2·3 per cent. of ash, the percentage of fat should be not less than 9 per cent., which may be taken as a low standard (9018). The authorities do not prosecute in cases of small deviations from the standard (9021-3). Sees no reason why a standard should not be fixed for cream. The taking of samples is so haphazard and so much in the hands of people who ought to be under control, and are not, that no definite conclusion can be drawn from the fact that few samples of cream have been taken. At present there is no standard for cream as regards fat. It might be desirable to have standards for different qualities of cream (9027-42). Thinks that a standard for milk should prescribe limits for fat and solids not fat separately (9043). Does not himself use the Adams method of analysis, and is surprised to learn that so many public analysts are stated to do so (9048-54). As a vice-president and sometime secretary of the Society of Public Analysts is satisfied that if the question were put before a representative meeting of the members there would be no difficulty in carrying a resolution in favour of 3·25 per cent. fat (9069-73). There is a general impression now that the real prosecutor is the public analyst, and this does not conduce to the dignity of the profession. The position is much improved by the analyst having merely to state the figures and leave other people to deal with them (9084-94).

Chalmers, Dr. A. K., D.P.H., Camb. (3374-3704).—Is Medical Officer of Health for Glasgow (3374-6). Milk supply of Glasgow comes from 1,145 cows locally kept and 770 farms in surrounding counties, chiefly Lanark,

Renfrew, and Ayr. About 80 to 90 per cent. of cows would be of Ayrshire breed (3377-82). Average of twenty-five samples of mixed milks from different farms, as delivered in Glasgow, gave 12·52 total solids, fat being 3·73 and solids not fat 8·79. These were exclusively morning milk (3383-94 and Appendix No. X). Details of analyses of retailers' milk (3394-3410 and Appendix No. XI). Prosecutions for adulteration of skimmed milk have been successful in Glasgow on the ground that solids not fat were below accepted proportion. Reference to case in Sheriff's Court at Paisley, in which purchaser asked for skimmed milk, and was served with separated milk. Decided not to be an offence (3425-32). Is not sure that a standard of fat for skimmed milk is necessary, provided it is understood that it should contain a certain proportion of fat (3433-45). Some standard or grading of cream would be desirable (3446-52). When a purchaser buys condensed milk he should know how much water to add to bring it to standard milk (3452-5). For milk suggests a standard of 3 per cent. of fat, and in winter, *i.e.*, November to January, 3·25 (3456-71). Separated milk may contain as little as 0·3 per cent. of fat (3509). If a standard for skimmed milk were fixed, would suggest 0·8 per cent. of fat as the minimum obtained by ordinary rising of cream, but the average quantity is greater (3543). One per cent. might fairly represent a standard (3672). If cows do not yield milk of a reasonable quality they should not be kept as milk-producers (3560). Admits that in comparing farmers' milk with retailers' milk the samples of the former refer to one month (September), and of the latter to ten months of the year, but considers September fairly represents the average of the year (3594-3607). Thinks the milk sold in Glasgow is generally mixed from different farms (3608-20). Quotes letter from secretary of Scottish Section of the Co-operative Union advocating the fixture of a standard for milk of not less than 3 per cent. (3658-64). Believes stall-fed cows referred to are largely fed on brewers' grains and distillers' refuse (3682).

CLIMATE, EFFECT OF.—Smith, 6998.

CONDENSED MILK.—Hill, 73-83, 127-30; Dyer, 368-70, 537-41; De Hailes, 698-706; Carrick, 1101-6; Cameron, 2511-24; Chalmers, 3452-5, 3526-30; Allen, 4728-36, 4799-4808; Lloyd, 6092-6109; Steel, 6375-80; Grigg, 6778-80; Long, 8154-67; Richmond, 8450-62; Fisher, 8889-8903; Cassal, 9018, 9055-63; Niven, 9667-71, 9802; Brown, 9842-9; Lehmann, 10169-10539; Lewin, 10519-34.

CONSUMERS' INTERESTS.—Hill, 296-7; Ashby, 1564-7; Stirling, 1866-8; Kennedy, 2147-51; Middleton, 2352, 2386; Finney, 3259-60; Chalmers, 3437-45, 3515, 3631, 3652-7; Curtis-Hayward, 4159, 4201-6, 4274-7; Allen, 4719; Hoskins, 5250, 5348; King, 5639-42; Ralston, 5748-51; Stratton, 6507; Grigg, 6697-8; Thwaite, 6948-52; Long, 8144-6; Richmond, 8785-90; Cassal, 9033; Niven, 9626, 9631-2; Brown, 9815-21, 9897, 9909-16; Maskelyne, 10001-9.

COWS:—

(*a*) *Breed*—Hill, 97; Dyer, 338-45, 378-88, 436-40; Beecroft, 899-902, 951-66; Gates, 1197-8, 1246; Pocock, 1257; Ashby, 1535-63; Stirling, 1811, 1958-61; Kennedy, 1999-2005, 2176; Marshall, 2273; Middleton, 2314-5, 2331-9; Cameron, 2546-56, 2598-9; Speir, 2720-3, 2899-2915; McConnell, 3096-3105, 3149-50; Finney, 3273-7; Chalmers, 3378-82; Curtis-Hayward, 4134-7, 4196-4200; Drysdale, 4307-8, 4388-9; Pearce, 5145-7; Hoskins, 5292; Ralston, 5659-60, 5864-7; Lloyd, 5960-9; Steel, 6347-54; 6413-7, 6449-58; Stratton, 6486, 6540-8; Smith, 7005-6; Ashcroft, 7485, 7515-8; Walker, 7634-43; Hoddinott, 7701-3, 7810; Long, 8074-7; Drinkwater, 9150-1; Brown, 9831; Lehmann, 10501-5; Lewin, 10556.

(*b*) *Condition* — Hill, 179, 282; Pocock, 1256-7; Cameron, 2485-6; Chalmers, 3474, 3560, 3568-76, 3697-3704; Curtis-Hayward, 4268-9; Lloyd, 5979-80; Stratton, 6515-9; Thwaite, 6799; Hoddinott, 7695-9; Adams, 7931; Niven, 9651-6; Lewin, 10556.

(*c*) *Feeding*—Hill, 182-94; Dyer, 363; De Hailes, 769-75; Beecroft, 852-3; Ashby, 1573-4; Kennedy, 2174-5; Marshall, 2189-97; Middleton, 2346-7, 2357-2369; Cameron, 2414-17, 2482-4; Carruthers, 2869; Speir, 2695-8, 2724-7, 2771-81, 2803, 2834-40; McConnell, 3130-4, 3169-72; Finney, 3187, 3286-7; Chalmers, 3476, 3564-6, 3682-3; Curtis-Hayward, 4269; Drysdale, 4308, 4334, 4376-9; Pearce, 5154-5; Hoskins, 5263, 5310-3; King, 5515, 5586-94; Ralston, 5673, 5792-5801, 5839-42; Lloyd, 5986-8, 6128-33, 6256; Steel, 6265, 6282-8; Stratton, 6575-7; Smith, 7002, 7008, 7014; Prideaux, 7480-1; Ashcroft, 7487; Hoddinott, 7687-95, 7803-9, 7888; Adams, 7931; Long, 8074; Drinkwater, 9156-73, 9307-12, 9480, 9489-9513; Niven, 9597-9, 9628-30, 9655-8, 9713-7; Brown, 9881-3; Maskelyne, 9995-6; Lewin, 10556.

(*d*) *Housing*—Hill, 184; De Hailes, 763; Cameron, 2414; Bowler, 3324; Thwaite, 6799; Hoddinott, 7852-5; Drinkwater, 9135-9, 9182-6, 9307, 9432-3;

CREAM.—Hill, 70-2; Dyer, 366-7, 536; De Hailes, 633-42, 707-28; Carrick, 1013-23, 1062-5, 1108; Gates, 1180-94, 1241-3; Stirling, 1821-4; Kennedy, 2022-58, 2065-74, 2132-48, 2158-61; Cameron, 2525-8; Speir, 2769-70, 2881-2; 3021-6; Chalmers, 3412-3, 3446-52, 3518-25, 3550-7; Curtis-Hayward, 4227-33, 4361; Allen, 4727; Pearce, 5195-9; King, 5497-5, 5504; Ralston, 5706-11; Lloyd, 6110-27; Steel, 6381-2, 6389-97, 6776-7; Prideaux, 7356-89, 7440-60; Ashcroft, 7532-8; Hoddinott, 7772-82; Long, 8108-14; Richmond, 8446-9; Fisher, 8872-8886; Cassal, 9018, 9027-42; Drinkwater, 9216-20; Niven, 9663-6, 9783-9800; Brown, 9837-42; Maskelyne, 10033-5; Lewin, 10635-9.

CURTIS-HAYWARD, Col. (4123-4289).—Nominated as a witness by the Royal Agricultural Society (4165). Is a member of the Technical Education Committee of the Gloucestershire County Council, and has had, for many years, a large herd of cows (4123-4). Finds great difference in quality of individual cows, particularly between morning and evening milkings. Results of analyses of milk supplied to dairy school, and also of milk from his own herd (4126-39). Would be sorry to say that no standard should be fixed, but cannot see where to fix it without injustice (4140-6). Does not think the enormous difference between the richness of morning and evening milk is appreciated. In his own herd the difference is 33 per cent., the cows being milked at 7 a.m. and 5 p.m. (4144-52). Is not aware of the provisions of Section 4 of the Food and Drugs Act, 1889 (4161-4). There has been no resolution upon, or discussion of, the subject by the R.A.S.E. (4166-71). In Gloucestershire there is a considerable body of opinion in favour of fixing no standard, but leaving things as they are (4171-3). Does not think much adulteration of milk prevails in Gloucestershire (4238-40). There is great difficulty in getting milkers at all, and still more in fixing hours of milking (4151, 4287-9).

D.

DEFENCE OF PERSON ACCUSED OF ADULTERATION—see Appeal to the Cow.

DE HAILES, ALFRED JAMES—(579-796).—Analyst to the Dairy Trade Protection Society (583). There is a good deal of adulteration, chiefly by the addition of separated milk to whole milk (585-6). Does not consider borax base preservatives as adulterants (588-93). Is not in favour of a legal standard, because of the great variation in milk (599-600). A low standard would encourage watering down, and a high standard would injure the honest trader: cannot conceive a fair standard (601-4). For the purpose of reporting on milk personally uses a standard of 8.8 of solids not fat and 3 of fat, but it is impossible to judge a milk analysis by any one of the figures alone (607-10). A legal standard would be to the interest of public analysts, but not of the public or traders (613). Inspectors cannot stir up milk in course of delivery so as to receive fair samples (626-32). Thinks the addition of say half per cent. of gelatine to cream is allowable, unless pasteurization is forbidden (633-43). Analysts should have a standard among themselves, but a man should not be convicted simply because his milk is below a standard (652-6). A standard of 12 per cent. total solids of which 3 is fat would not be too high for the milk of the country, but there are thousands of milks which do not reach 9 per cent. solids not fat or 12 per cent. total solids (665). When milk is scarce there is a practice in some quarters of diluting unsweetened condensed milk and mixing it with new milk (698-706). Know that some members of the Dairy Trade Protection Society add gelatine to cream, but the society did not instruct him to defend the practice, though he personally thinks it legitimate (707-28). Instances of low percentage of non-fatty

solids during a drought (729-31). Difficulties of obtaining a fair sample of milk in course of delivery, or in transit, (732-50). Instances of genuine milks falling below standard (751-8).) and above (758). Gives his inspector instructions as to taking samples, and thinks the result sufficiently good to enable him to express an opinion (764-6). Thinks the fat may be increased by feeding, but not the solids not fat (774). Could give the names of men who make a practice daily of watering their milk down to the present standard (784). That standard should be raised, but should not be given the force of law (785-91). Injustice has been done by taking samples from counter-pans (792-6).

DENMARK.—Laws and regulations as to dairy products—Dyer, 561-4; Speir, 2744-8, 2995-3011. *See* also Appendix XXXIV.

DISTRICTS SUPPLYING MILK.—Hill, 254-5; Dyer, 352, 362-6; Beecroft, 829-31; Carrick, 1030-9; Gates, 1247; Ashby, 1449-52, 1554-6; Stirling, 1771; Kennedy, 2075-8; Marshall, 2203-5; Cameron, 2472; Carruthers, 2662, 2692; McConnell, 3082-3; Chalmers, 3377; Macdougald, 4837-8, 4879-91; Pearce, 5083-7; Prideaux, 7436-8; Hoddinott, 7684-6, 7767-71; Long, 8077; Richmond, 8484-91, 8768; Drinkwater, 9129-42, 9146-9, 9435-8.

DRINKWATER, T. W., Ph.D., F.R.C.P., Ed. (9115-9559).—Represents the Edinburgh and District Dairy Association, to which he is analyst (9115-20). Majority of the association think 2·75 per cent. fat would be a fair standard; a good number object to any standard, and that milk, however poor, if genuine, should be sold as milk. Personally thinks it necessary to set a standard which can be reached by good cows, taking the average over a district (9121-9.) No milk comes to Edinburgh from any far distance; about one-third comes from farms beyond the city. There are about 450 dairies in the city. There is a tendency, however, to reduce the number of byres in the city. Brewers' grains are the constant food (9121-71). There is no standard in Edinburgh, each case being taken on its merits. Thinks wholesale men might reach a standard of 3 per cent., but the milk would not reach the shopkeeper at that, and, unless it were well mixed, he might suffer. There are few convictions in Edinburgh, but it is difficult to say if there is much adulteration (9203-15). Does not think a standard for cream necessary; there would be more difficulty than in the case of milk in fixing one (9216-20). Admits that the general character of the milk supply of Edinburgh is below that of other large cities, while the price is, he thinks, higher (9223-33). Considers 2·3 per cent. fat too low for an average sample of mixed milk, but has condoned a milk showing only 2·1 per cent., which was admitted to be from a single cow (9243-9). It is the custom to milk three times a day —at 4, 10, and 5 o'clock (9292). There have been a number of convictions in Edinburgh for watering milk, but not for abstracting cream. The latter cases he has generally won. The sheriffs take a broad, common-sense view of each case on its merits more than any standard. If one analyst states that a milk is adulterated and another that he cannot certify it is adulterated the case is dismissed as not proven. Explanation of facts in a case in which he stated in court that he could not certify a milk from a single cow which contained only 2·1 per cent. fat was adulterated (9321-9414). A number of samples taken by the association in February showed an average of 2·64 per cent. of fat, but a further series brought up the average to 2·84 (9458-62). If six months' notice were given of raising the standard, no doubt feeders could bring their milk up to it, but the price of milk would rise, and the consumer would suffer (9558-9).

DRYSDALE, JOHN (4290-4472).—Represents the Scottish Chamber of Agriculture. Is part proprietor of the Fairfield Farming Co. (4290-5). Chamber considers 3 per cent. of fat would be a proper legal standard (4293-4). Results of investigations carried out by his company with the view of raising the average standard of the herd. Has only on one occasion found genuine milk which contained less than 3 per cent. fat, and this was in the case of two cows which had quite recently aborted. Of 68 cows tested, 9 averaged 5·37, 22 averaged 4·69, 14 averaged 4·21, and 23 averaged 3·55 of fat. Herd consists of Ayrshire cows (4307-8). Thinks that in buying milk he does not always get the whole product of the cow—the strippings being kept back. Found that with a cow giving 21lbs. of milk the 16lbs. first drawn contained 2·30 per cent. of fat, while the 5lbs. last drawn contained 5·70. Convinced that many farmers retain the strippings, and this accounts for a great deal of poor milk sold (4317). Cannot raise a 3 per cent. cow to a 5 per cent. cow, but can affect her milk very considerably by judicious feeding (4334). Milking is done by carters' and cowmen's wives and daughters living on the farm (4337-41). Suggests two standards for cream of 15 and 30 per cent. of fat (4361-2). There is no reason why a poor man's single cow should give poor milk (4350). The production by a cow of a large quantity of milk is not inconsistent with good quality —quite the contrary (4375). By breeding from good dairy cows the quality of milk may be much improved (4388). The old practice of milking three times a day is practically given up (4401). Milking machines are used to some extent in Scotland, but not quite so much as a few years ago (4409-11). Thinks there is no difficulty in a milk supplier arranging so as to send out average milk (4438). Seals churns containing whole milk or cream when sent by rail (4441). Fears that inspectors do not always take fair samples of milk (4452-64). There should be due notice given of the fixing of a standard (4469-72).

DYER, BERNARD, D.Sc. (319-578).—Is Public Analyst for Leicestershire, Wiltshire, &c. (320). Society of Public Analysts adopts limit of 8·5 per cent. non-fatty solids and 3 per cent. fat (328-31). Some individual analysts adopted 2·75, while that was the standard recognised by the Government Laboratory (337). Milk occasionally falls naturally below 8·5 and 3, but this is in most cases due to abnormality of individual cows, except in certain breeds, *e.g.*, Dutch (338). Cows yielding poor quality milk have been gradually eliminated, but there are still a number of Dutch cows kept in Essex (339-44). Standard of 8·5 and 3 would prevent excessive adulteration, but is low, having regard to average quality of milk (346). Results of 575 analyses of milk (348-61). But for effects of exceptional seasons limit might be 12 per cent. total solids, of which 3·25 should be fat (363). Milk rich in fat is usually, but not always, rich in non-fatty solids; fat is a much more variable figure than other solids. If non-fatty solids remain constant while fat is increased, percentage of former slightly depressed. It has been contended that non-fatty solids should be estimated on the basis of fat-free milk (365). Condensed milk should contain at least as much fat as proteids, and should be made from whole milk containing not less than 3·5 per cent. of fat (368). It might be possible to make a standard of milk for towns and another for the country (372). The Dutch element in cattle is less in the Dutch cow than the offspring of the Dutch cow (382). No doubt cows have been imported since 1892 (436). Jerseys do not largely exist in herds sending milk to London (387). It is absolutely impracticable to vary standards for the time of day or time of year (390). Thinks cases of milk adulteration, and convictions, more numerous now than previously (392). An analyst must use discretion, whatever standard is fixed (396). Result of officially fixing the standard—even if it were that now generally adopted—would be to make it more effective in checking adulteration; magistrates would be strengthened in administering the law (427-8). There is a considerable difference between morning and evening milk (447). Difference in fat was 0·43 (469). Found practically no difference between summer and winter averages (453). If there were some means short of a prosecution by which a man might be warned, in the first instance, that his milk is found deficient, would be prepared to adopt a standard of 8·5 and 3·25, making 11·75 solids (556-7). In that case a 12 per cent. standard might possibly work (560). 8·75 would be altogether too high a standard, and some of the best milk sold would be rejected under it (578).

F.

FINNEY, R. (3181-3306).—Is a dairy farmer, and represents the Derbyshire Dairy Farmers' Association (3181-3). Dairy farmers in Derbyshire think it would be risky to fix a legal standard, because some cows give lower results than others, and with a high

standard genuine milk would be condemned and with a low one good milk would be watered down (3184-7). Great quantity of grains used by dairy farmers in Derbyshire, and mangolds also largely used (3187). His association desires that if a farmer sends pure milk, and can prove it pure, he should not be liable to prosecution (3193). Thinks farmer should not be liable for milk after it leaves his hands (3199-3208). Does not think present standard has pressed unduly on milk producers (3236). Has had no complaints of his own milk (3265-6).

Fisher, Walter William, M.A. (3706-4122, 8841-9114).—Is president of the Society of Public Analysts, and Public Analyst for Oxford, &c. (3706-12). Has been desired by the council of the society to give evidence (3712). The present standard adopted by the society is 3 per cent. fat and 11·5 total solids. History of its adoption. The method of analysis proposed by Dr. Adams was investigated by a committee, and, it being found more accurate than the method previously used, the standard of fat was raised to 3 per cent. in 1886, the new standard being co-relative with the old. Mr. Adams' system is not generally adopted by public analysts, but it is the official method of the society (3713-33). Description of Werner-Schmidt method of analysis (3734-43). Use of the "slide rule" formula for calculating the fat in milk from the specific gravity (3744-6). Council of society recommend that standard be fixed at 3 per cent. fat. Some members were in favour of higher figure—3·5, 3·25, and 3·2 being suggested (3749). Effect of Section 4, Food and Drugs Act, on position and duties of public analysts (3750-9, 3805-22). Reasons for particular standard recommended (3760-8). The operation of the Food and Drugs Acts has improved the milk supply of the country, but is not prepared to suggest a further raising of the standard in consequence (3770-98). Use of Heisch correction for percentage of solids not fat (3799-3801). Analysts are compelled to depart from rigid standard in exceptional seasons (3802-35). The standard must not be exaggerated, as the judgment of analysts would be discredited if prosecutions commonly failed (3837-43). Suggests that in estimating the amount of adulteration in milk falling below 3 per cent. of fat the deficiency should be calculated on the assumption that the milk originally contained 3·2 per cent. of fat (3843-51). Is not in favour of an officially prescribed method of analysis, but if this were thought desirable would be ready on behalf of his society to advise on the subject (3852-77). Has never had a disagreement with Government Laboratory about milk. Process of analysis of sour milk (3878-3923). Mode of collecting and preserving samples of milk; thinks a more uniform method desirable (3924-9). Uncertainty by analysts as to standard adopted by Government Laboratory has at times been felt a difficulty, and has perhaps led them to adopt in practice a lower standard than they would otherwise (3966-82). Announcement of recent alteration of standard adopted by Government Laboratory (3983-4004). If a milk shows less than 12 per cent. total solids it raises a reasonable presumption that something is amiss with it (4046). A milk containing exactly 3 per cent. fat and 8·50 solids not fat has probably been adulterated (4054-73). In doubtful cases would determine ash and probably also the nitrogen (4065-95). Does not think it desirable that any standard which may be fixed should prescribe limits for nitrogen or ash, although analysts may make use of them for confirming their judgment in certain cases (4089-97). A variable standard, according to season of the year, might be practicable (4098-4103). Corrects previous statement as to use of Adams' method. At a meeting of council found that seven out of ten members present use it for all important determinations, but cannot actually say whether this means that it is used in all cases of prosecution, though this would be implied to his mind (8841-60). Submits a table (see Appendix, No. XXI) illustrating the action of the limits now adopted and the effect of adopting other limits (8863-71). Does not think there is any need at present to fix a standard for cream (8872-80). Some members of the society think it desirable to make a distinction, if possible, between hand-skimmed and machine-skimmed milk, and that if sold as hand-skimmed it ought to contain 1 per cent. of fat (8888). In condensed milk the fat should be not less than the proteids, and the proteids should be determined by estimating the nitrogen and multiplying by 6¼. Does not think it necessary to interfere in regard to the degree of condensation (8889-8903). Produces a form of label used by one of the authorities for which he acts (8906 and Appendix, No. XXII).

Food and Drugs Act, 1899.—Effect of, and procedure under Section 4.—Speir, 2701-8, 2729-51; Fisher, 3750-60, 3805-26; Curtis-Hayward, 4161-4; Drysdale, 4444-65; Allen, 4511-28, 4564-75, 4519-37, 4798-4802; King, 5538-55; Lloyd, 6054-70; Stratton, 6581-3; Thwaite, 6805, 6913-45; Ashcroft, 7528; Hoddinott, 7716-28, 7739-45, 7838-46; Cassal, 9024; Drinkwater, 9472, 9481-5; Maskelyne, 9972, 10045; Lewin, 10671-82.

G.

Gates, Alfred (1154-1254).—Is manager of dairy factory at Sherborne for 12 years (1154-9). Has records of 4,031 samples taken from 390,000 gallons of milk and tested by Babcock test. Of these 105 showed 3 per cent. of fat, 25 below 3 per cent., and remainder 3·20 or more. None fell below 2·80 per cent (1161-79). Thinks a mixed herd milk would work out at 3·20 per cent. of fat, but would not like to fix standard at that (1208). Sells separated milk for biscuit-making and various other purposes (1227). Uses preservatives for cream, and it would be impossible to carry on trade without them. Notifies the fact, and does not think this injures the sale (1234-9). Thinks it almost impossible to fix a standard for cream (1241-3). Has found milk in an unlocked churn habitually tampered with on the railway (1249).

Genuine Milk.—See Appeal to the Cow.

Gerber Test.—Carrick, 1091-4; Ashby, 1579; Stirling, 1840; Curtis-Hayward, 4177-8, 4258-61; Hoskins, 5239; Smith, 7037, 7215-6; Prideaux, 7263-7; Richmond, 8509-12; Niven, 9618; Maskelyne, 9980, 10066; Lewin, 10568, 10570.

Government Laboratory Standard.—Dyer, 334-7, 524-7; Pocock, 1255, 1275-83; Ashby, 1485, 1651; Stirling, 1972-3; Cameron, 2488-95, 2617-20; Fisher, 3878-90, 3966-4006; Allen, 4594, 4636-4662, 4789-95; King, 5538-55; Ralston, 5702-5; Steel, 6270-1, 6321-34; Ashcroft, 7503-4; Richmond, 8401-23; Cassal, 9044; Drinkwater, 9517-22; Lewin, 10546-67.

Grading Milk According to Quality.—Speir, 2767-8, 3034; Drysdale, 4419-23; Pearce, 5112; King, 5398-5400; Ralston, 5754; Smith, 7012-3, 7180-3; Ashcroft, 7519-23; Walker, 7569-99, 7619-21, 7653-7; Long, 8134-7; Brown, 9894-5; Maskelyne, 9973, 9986, 10022-6, 10036-9, 10051-7, 10157-62.

Grigg, W. H. (6584-6787).—Is Chairman of the Council of the Sanitary Inspectors' Association, and represents their views (6584-7). Describes methods of taking samples of milk. Difficulty is occasioned by the necessity of purchasing a pint of milk, because the people who are commonly defrauded are those in the very poor districts where it is unusual to buy so much as a pint (6590-8). Produces and describes specimens of bottles, labels, &c., used for sampling. Thinks that inspectors generally would welcome a general regulation by a central authority prescribing the method of taking samples (6599-6615). It is the practice to take a sample from each churn of a consignment, and it is a separate offence if a bad sample is taken from each (6642-3, 6652-7). Admits there may be inspectors who try to get convictions, and may act unfairly, but is certain this is not the rule. Inspectors ought not to pick their time, and does not think they do so designedly. They buy when, and as, ordinary customers are buying (6695-6704). There is generally an understanding as to the number of samples an inspector shall take in the year (6720).

H.

Hill, Dr. Alfred (1-318).—Is Medical Officer of Health and Public Analyst for Birmingham (1-2). Has never found the total solids in a mixed milk fall below 12·68 per cent.; the average of over 100 cows was 13 (6-7). Produce of a single cow is seldom sold, and never, within his knowledge, been the subject of a prosecution (11-12). Analyses of milk from 111 cows (see Appendix I) varied from 11·18 to 17·01 per cent. total solids, and from 2·36 to 8·44 per cent. fat (13-18). A fair standard for milk from a dairy of not

less than 3 or 5 cows would be 12 per cent. total solids, of which not less than 3·5 per cent. should be fat (19-21). Adulteration of milk in Birmingham is constant and habitual, and takes place on the farm as well as by dealers (23-38). Effect of standard is to cause milk vendors to work down to it (28). Standard should be not less than 12 per cent. total solids and not less than 3·5 per cent. of fat (39-46). Morning milk is poorer than evening, but would not discriminate in fixing standard—nor as regards time of year (56-60). Milk churns sent by train are never locked (67, 84-96). Addition of preservative does not seriously affect amount of total solids (68). Certain brands of condensed milk are good, but others are very poor in fat (79). Would not consider milk containing 3 per cent. of fat and 12 per cent. total solids as genuine (125). Whatever standard were fixed would be applied with discretion by analysts and prosecuting authorities (225-30). Milk comes to Birmingham from Warwickshire, Staffordshire, Worcestershire, Derbyshire, and Gloucestershire (255). Considers standard suggested easy to maintain for mixed milks, and for milk from individual cows would apply no standard (263-5). The effect of the suggested standard would be to raise the quality of milk supplied (297).

Hoddinott, J. P. (7658-7905).—Is managing director of the Great Western and Metropolitan Dairies, which is probably the second largest wholesale firm in the country (7658-61, 7824-7). Contracts stipulate for 3·5 per cent. fat, but many farmers cross this out and say it is impossible throughout the year. During February, March, April, May, and part of June there is a certain proportion of milk below 3 per cent.—from 2·5 to 3, but very few indeed below 2·75. His experience is that 70 per cent. of the farmers send over 3 per cent. nearly all the year; 10 per cent. are for three months below 3 per cent., but it is not always the same 10 per cent. (7662-72). There is a difficulty in getting cows to eat sufficient dry nutritive food when they go out first on to the grass, even when it is given to them (7687-95). High feeding with artificial food is not good for the calves. Temperature affects the quality of milk yielded (7696-8). A standard of 3 per cent. fat and 9 per cent. solids not fat would be a fair minimum for eight months of the year, and for four months it should not exceed 2·75 per cent. fat (7704-14). There may be a variation of 0·5 per cent. in the fat in the milk from the same herd from day to day. It is impossible therefore to get a reliable appeal to the herd when a presumption is raised against the milk from it (7721-8). Thinks the position of the wholesale milk dealer is altered by the Act of 1899 (7740-5). Honest men now produce a high standard of milk where their land and buildings allow them to do so. The difficulty arises on land where the quality of food grown is inferior. Knows, however, some very poor land which gives better butter fat in summer months than much richer land. It depends also on the breed of cattle, and still more on the selection of animals of the particular breed (7806-11). Thinks he may be in considerable danger under the new Act of imprisonment (7837-50). During the winter months a certain quantity is sent up only once a day, but as a rule there would be the greatest difficulty in having morning and evening milk sent up together (7869-83).

Hoskins, Robert J. (5232-5359).—Represents the Evercreech and Mid-Somerset Agricultural Society (5232). Society considers a standard of 2·75 per cent. of fat and 8·50 or 9 per cent. solids not fat would be fair (5234-6). If cows are calving all the year round, a more uniform percentage of fat in milk can be obtained. Finds it difficult in May to get up to 2·75 of fat. Milk is always poorer in May, and a very wet May still further affects it (5238). Instance quoted of prosecution in which the cows when tested were reported as giving milk showing by analysis 8 per cent. added water. Samples ought to be taken at the departure station, as robbing of milk goes on in transit by railway. Also by farmers' servants. Think churns should be stamped and milk sent by weight (5239-45). In a test made by himself the first half-pint drawn from a can contained 1·1 per cent. of fat and the last half-pint 11 per cent. (5247). Thinks a sample should be taken by mixing the contents of all the churns of a consignment, and not from one churn only (5252). It is a mistake to feed too high, as the result is quantity and not quality of milk (5263). Gives results of tests of cows milked at the farms in competition for prizes offered by his Society. They ranged from 3 to 4·1 per cent. of fat in morning's milk in August (5263-76). The difficulty in keeping up to standard would be greater with cheese-makers than with those who send away milk all the year round (5299-5303). Thinks that the quality as well as the quantity of milk produced varies from one field to another (5314-7). The longer the period of lactation the better the milk (5318-22). Suggests standard of 2·75 of fat for April, May, and June, in other months it might be 3 per cent. (5340).

I.

Intervals of Milking.—*See* Milking, Hours of, and Morning and Evening Milk.

K.

Kennedy, Hugh (1983-2176).—Is president of the Glasgow Dairymen's Association, and proprietor of the Glasgow City Dairy (1983-92). Standard should not be fixed higher than 2·75 per cent. of fat, because of possibility of injudicious sampling, and because Glasgow is provided with milk from Ayrshire cows, which give a lower percentage of fat than Guernsey, Jersey, and South of England cows (1993-2005). Does not think it possible to fix a standard for skim or separated milk (2006-21). Cream sold in Glasgow ranges from 8 or 9 per cent. up to 50 to 54 per cent. of butter fat. There are three grades known in the trade, viz., "cream," "double cream," and "working," or "switching" cream (2022-58). No standard should be fixed for cream; it should be sold according to demand, use and wont, according to the price paid (2052). Instance of discrepancy of analyses of the same milk (2059-63). Has known no other standard than 2·75, and works by this in his business (2086-7). Finds milk supplied very often falls below 3 per cent. (2100). Considers 2·75 a fair and reasonable standard for Scotland and Glasgow. The trade ought to be protected (2106-7). Separated milk is largely sold in Glasgow. It does not pay so well as sweet milk, but the public demand it. It contains 0·15 per cent. of fat. Hand-skimmed and separated milk are mixed and sold indiscriminately (2103-32). If a standard for cream were fixed it should be a low one, say, 9 per cent. of fat. If a standard of, say, 25 per cent. were fixed the working classes would not get cream at all, as they now do (2136-51). In a prosecution for selling as cream an article not much better than milk, the case was lost, and on appeal it was decided there was no standard for cream (2158-60). Milk is poorest in the spring, just before the calving time (2171).

King, J. Falconer (5360-5645).—Is Public Analyst for Edinburgh, etc. (5360-2). It is absolutely necessary that a standard of milk should be fixed for both milk and cream. Unless some standard is fixed the Food and Drugs Act in Edinburgh will soon become a dead-letter so far as milk is concerned, as the Sheriffs refuse to convict unless a standard is fixed, or unless some person saw the actual adulteration, or the evidence of the Public Analyst is totally uncontradicted. Cites a case in which a milk contained only 2·1 per cent. of fat, and the Sheriff dismissed the case (5364-71). Thinks 3·25 per cent. and 8·5 solids not fat would be a fair standard to fix (5373-80). Thinks a good deal of milk is adulterated in Edinburgh by the abstraction of fat from the evening milk. The supply of the city comes largely from cows kept within it (5381-8). The Edinburgh Milk Supply Association buy their milk on a standard of 3·5 per cent of fat, and have no difficulty in getting any quantity. This milk comes mainly from the country (5389-90). The price of milk in Edinburgh varies considerably (5393). It would be desirable if it were practicable, that milk should be sold according to quality (5398-5400). The refuse product of breweries and distilleries is largely used for feeding cows kept in Edinburgh (5404). Cows are usually milked three times in the 24 hours in Edinburgh, viz., at 4 or 5 a.m., 11 a.m. and 5 or 6 p.m. (5409-13). Cases are dismissed not on account of divergence of analytical results but of difference of opinion between analysts as to the inference to be drawn from the results (5422-34). In cases of doubt the de-

termination of the ash and nitrogen would assist an analyst in forming a conclusion, but does not think a standard could be fixed for them (5438-45). Thinks the position of analysts would be improved if they had simply to give the result of their analyses (5449-54). A standard of from 1 to 1·25 of fat would be fair for hand-skimmed milk, and for separated milk 8·5 per cent. non-fatty solids (5493-6). For cream suggests a standard of 40 per cent. of fat (5497-5504). Is not aware that in cases of prosecution which have been dismissed any application for a reference to Somerset House has been made to the Sheriff (5536-55). The Edinburgh Milk Supply Association will not take any milk below 3 per cent. of fat, and if the supplier sends a higher quality he is paid more (5556-66). Thinks 3 per cent. of fat a fair standard, and would be satisfied with it (5601-8). Thinks the population generally have no sympathy with adulterators, and resent the unfortunate condition of affairs, as regards the application of the Act in Edinburgh (5642).

L

Land, Effect on quality of milk.—Beecroft, 805, 815, 820-2, 830-47, 940-1, 947-50; Pocock, 1257; Marshall, 2272; McConnell, 3158-62; Finney, 3268; Hoskins, 5314-7; Stratton, 6515; Hoddinott, 7809; Adams, 7922-4; Drinkwater, 9311-3; Maskelyne, 10130.

Lehmann, C. T. (10169-10539).—Represents the Condensed Milk Defence Association (10169-77). Nine-tenths of the condensed milk is imported, and his firm are the largest importers of condensed machine-skimmed milk (10178-93). They have three factories in Holland, from whence all their supplies come. Submits diagrams showing the results of analyses of milk delivered to these factories. The milk is bought by contracts, specifying that it must contain the full cream, and is judged by a standard representing the average quality of milk at the time of year, and in the particular district. The quality of the milk ranges from about 2·5 per cent. fat in the spring to about 3·6 or 3·7 per cent. in the autumn. Believes that Dutch milk is, on the whole, poorer than the milk of any other country (10196-70). Makes and imports chiefly condensed machine-skimmed milk, but also some condensed full cream milk. The average degree of condensation is to one-third (10271-96). Is not aware that analyses of Dutch milk which have been made by official analysts show an average percentage of 3·62 of fat and 12½ total solids. Thinks this would not be normal (10317-36). Certain of his products have been taken by the Customs and analysed. In one case the sample was reported as impoverished by the removal of 15 per cent. of fat, but does not know by what standard it was judged. Could not guarantee that the original milk contained 3 per cent. of fat during about four or five months in the year (10337-57). Describes the various brands of milk which his firm sells. There is no reason why their composition should vary more widely than that of the original milk. Provided labels in accordance with the present Act, but vendors may have old stock, and for this slips were provided for affixing to the tins (10357-400). Does not think a standard can be fixed for machine-skimmed milk, and for full cream it would be difficult, and it would have to be very elastic (10401). There is not, so far as he knows, any manufacture of unsweetened condensed machine-skimmed milk, and although large quantities of unsweetened condensed whole milk come into the country they are nearly all re-exported. The English public, or any rate the lower-class public, will not take the unsweetened kind (10423-34). Thinks that in fixing a standard for condensed whole milk the limits should be those of full cream milk as received from the farmers; the ratio of fat to solids not fat is the only basis which can be taken. Is not prepared to suggest any particular standard (10448-539).

Lewin, George, F.I.C. (10540-10697).—Is a Superintending Analyst of the Inland Revenue Branch of the Government Laboratory, largely engaged in connection with analyses of samples entered under the Food and Drugs Acts (10540-5). The Government Laboratory became connected with the Food and Drugs Act in 1875, and consequently an investigation was made into the composition of genuine milk and the best method of analysis, so as to fix limits as to when a charge of adulteration could be sustained. The limits then taken were 2·5 per cent. fat and 8·5 non-fatty solids. A not inconsiderable number of the samples obtained showed an amount of fat as low as, or even lower than, this limit, and more regard was had then than now to the results yielded by single cows. A further investigation was made in 1891-2, and the limit of fat was raised in 1894 to 2·75 per cent., and five years later to 3 per cent. The general policy has been to follow closely the enhanced quality of the milk supply resulting from the natural operation of the Act (10546-54). Summarises the results of the investigations into the milk of dairies and of individual cows (10556-63, and Appendix No. XXVII). The method of analysis—the maceration process—adopted has been the same throughout. Describes the principal methods of milk analysis now recognised, viz., (1) Dry extraction methods; (2) wet extraction methods; (3) centrifugal methods; (4) calculation method; (5) maceration method. Describes the method in general use in the Government Laboratory for the analysis of sour milk (10566). The validity of this method has been determined by a series of analyses made over a long period of time, of milk of known composition, which has been kept, and they show that the actual change which has taken place in the milk by keeping can be determined within a few hundredths of a per cent. If a sample is securely sealed and properly kept it does not really matter whether it is 21 days or 21 months afterwards that it is analysed by this process. (10566-618 and Appendix No. XXIX). Hands in a list of analyses of condensed milks supplied to the Government service. Considers that a standard assuming 3·25 per cent. of fat in the original milk—which in the case of milk condensed to one-third of its weight, would be equal to 9·75 per cent. of fat in the condensed milk—is reasonable. Thinks that a limitation of the quantity of sugar in condensed milk is desirable (10621-4). There is no very great demand for a standard for cream, although analysts no doubt find a difficulty in the absence of a recognised standard (10635-9). It is not necessary to declare a standard for separated milk as regards solids not fat, because this is involved in the standard for normal whole milk, and a standard for fat in skimmed milk is not required (10640-7). Complaints have arisen of the manner in which samples of milk are presented for analysis, but a circular issued by the Local Government Board in 1894 caused some improvement. Does not think the quantity of milk required to be procured under the Food and Drugs Act can be reduced (10648-69). Undoubtedly some regulation should be made under Section 4 of the Act. Thinks the Committee must first determine what are the normal constituents in milk, and afterwards determine the extent of the deficiency in such constituents which shall raise a presumption of adulteration. Suggests 11·75 per cent. total solids, of which no less than 3 should be fat, would be an ideal standard, and preferable to one of 9 per cent. solids not fat, and 3 per cent. fat (10670-89). Does not think the addition of 0·5 per cent. of fat to a milk naturally containing 3 per cent. could be detected by analyst, but there is a point beyond which such a mixture could be detected (10594-7).

Lloyd, F. J. (5912-6256).—Analyst to the British Dairy Farmers' Association and Metropolitan Dairymen's Society (5914). In 1894 laid before Select Committee on Food Products Adulteration results of 1,330 analyses of milk, of which 24·8 per cent. were adulterated, *i.e.*, were below 2·7 per cent. fat, or 8·55 per cent. solids not fat. Average composition of 1,000 genuine samples was: fat 3·63 per cent.; casein, etc., 8·99 per cent. (5916-34). Then proposed a standard of 12 per cent. total solids, containing not less than 3 per cent. of fat (5935-7). Results of the analyses of 917 samples of genuine milk received from members of the Metropolitan Dairymen's Society during three years showed an average of 3·55 per cent. fat and 8·97 per cent. other solids (5938-53 and Appendix No. XVI). Analyses of milk from dairy herds in Somerset during the cheese-making seasons of 1892 to 1897 showed an average of 3·65 per cent. and 8·99 solids not fat (5954-8). Instances of abnormal milk (5970-8). Effect on milk of the time since calving; it is poorest when the cows commence to give milk, and gradually increases in quality to the end of milking (5979-80). Has no doubt that the com-

position of milk can be affected by feeding. Experiments which appear to show the contrary have not been carried on for a sufficiently long period (5986). The effect of drought on milk is very striking, telling mainly on the solids not fat, but also sometimes on the fat (5988-6007). Considers it desirable that standards should be fixed, for the purpose of preventing the addition of water or separated milk to whole milk. Admits the difficulty caused by the difference between morning and evening milk, and suggests the possibility of milking three times a day so as to equalise the intervals (6011-23). Thinks a farmer selling milk must be held responsible for a proper supply, and should know the capabilities of all the cows he keeps, testing the produce of each cow (6024-8). There are two methods of fixing a standard—either by limiting the fat and total solids, or by separately limiting the fat and the other solids (6029-31). Would recommend that the standard should be fixed by first stating the composition of milk of good quality, for which 3 per cent. fat and 9 per cent. solids not fat are the lowest limits which could be taken, and then making a certain allowance for departure from the standard. Thus milk should be considered to be adulterated if it did not contain more than 2·7 per cent. fat or 8·55 per cent. of solids not fat, the proportion of adulteration to be calculated on the assumption that it was originally average milk (6032-91). Condensed milk is usually sold with a label specifying the amount of water to be added, and it should be stipulated that when so diluted the liquid should conform to the standard fixed for milk. Where there is no label the standard should be 12 per cent. of fat (6092-6109). Would distinguish between potted cream and cream sold for butter-making. Suggests a minimum limit of 40 per cent. of fat for the former. Devonshire cream sometimes reaches 75 per cent. (6110-27). When there is a short supply of milk there is an increase of adulteration (6149). Thinks it desirable that public analysts should state the figures of their analysis on their certificates (6179-87). Thinks an analyst ought not to advise about proceedings (6225). Thinks the quality of milk is improving over England within the last few years (6238). There is a maximum quality of milk natural to every cow, and you may give her twice as much food and she will not exceed it. He has to deal with cases in which the cow falls below her natural quality (6256).

Local Authorities and Administration of Food and Drugs Acts.—Hill, 226, 256-71; Dyer, 350-1, 433-5, 543, 556-7, 568-76; Ashby, 1476-8, 1587-9, 1705-9; Stirling, 1975-7; Middleton, 2396-2401; Cameron, 2419-33, 2507, 2610; Speir, 2860-2; McConnell, 3063; Bowler, 3317-23; Fisher, 3770-3; Allen, 4513-29, 4547-52, 4663-75; Macdougald, 4919-27; King, 5366-8; Grigg, 6607-6616, 6711-28; Thwaite, 6952-9; Long, 8099; Cassal, 9015, 9023, 9044-7, 9066-8; Drinkwater, 9318-27.

Local Standards.—Dyer, 372; Stirling, 1958; Allen, 4576-81; Richmond, 8496-9; Drinkwater, 9206-7.

Locking of Railway Churns.—Hill, 66, 84-96, 105-6, 131-6, 251-3; Carrick, 1133-43; Gates, 1248-54; Pocock, 1360-2; Middleton, 2300-9; Cameron, 2537-8; Finney, 3208, 3222-30, 3302-6; Drysdale, 4440-3; Hoskins, 5240-5, 5353-9; Ralston, 5690-9, 5802-28; Steel, 6432-44; Stratton, 6569-71; Prideaux, 7292-7300; Adams, 7936-41; Long, 8260-2; Maskelyne, 10163-4.

Long, James (8052-8291).—Has been Professor of Dairying at the Royal Agricultural College, Cirencester (8052-5). The average percentage of fat in milk supplied from farms to towns is 3·4. Warington gives 3·7, the Geneva experimental station in New York State gives 3·9, and Fleischmann gives 3·4. Does not suggest any figures for solids not fat, as they are misleading (8056-64). Interval between milkings affects the quality of milk, but the hours of milking could be altered if the law made it necessary to do so (8069-74). There is a custom in Lancashire of selling "fore" milk and "strippings" separately at different prices, but the fixture of a sensible standard would stop this. It is impossible to improve the fat percentage of a cow by feeding if she is properly fed. If she is underfed she will fall away in yield or quality of milk. The only method of increasing the milking property of cows is by breeding and selection. A farmer can produce within reason any quality of milk by a system of breeding and selection (8074). To a normally useful milk containing 3·5 per cent. of fat it would be possible to add 28 per cent. of separated milk on a 2·5 standard without serious fear of detection. Instances given of tests made to ascertain the amount of separated milk which may be added to ordinary milk (8081-5). Standards adopted in different American States quoted. Suggests a standard of 3 per cent. fat and 12 per cent. total solids. If it were fixed higher would suggest a lowering of the standard in April, May, and June (8092-5). Suggests that retail milk sellers should be licensed at a nominal fee. An appeal to the cow should be made within two days (8099-8107). Thinks a fair standard would largely weed out the dishonest and careless traders. The legitimate trade is able to take care of itself. Possibly a higher price for milk would result. The causes of low quality milk are the addition of water and separated milk, bad feeding, failure to strip the cows, milking too many hours apart, and the possession of inferior milking cows. If a standard is fixed for cream it should be 40 per cent. of fat, but if it were sold without being artificially thickened does not think a standard necessary (8108-14). It might be possible to ear-mark separated milk by insisting on the introduction of some innocuous substance, *e.g.*, starch (8120-30). Thinks that the consumption of milk in this country has increased in recent years (8138-47). Would propose 3·25 per cent. of fat as the standard, but does not think in the present state of public opinion it is practicable (8176-8). Thinks the general quality of milk has deteriorated during the past ten years (8211-18). If a sample of a farmer's milk were taken from only one churn it might not be a true sample of the bulk, and an appeal to the herd in that case would convict him unjustly. He ought however to mix all his milk before sending it away (8263-91).

M.

Macdougald, G. D. (4819-5078).—Is County Analyst for Perth, Fife, etc. (4819). Has analysed a large number of samples of milk by a specially devised apparatus—a modification of the Leffman-Beam process—the object of which is to make the analysis as rapidly as possible (4820-7). Submits the results of the examination of 12,069 samples of milk, the gross average of them being 3·82 per cent. fat, and 8·68 per cent. non-fatty solids. The samples came mainly from large dairy concerns, but include also those coming to him as public analyst (4828-35). Submits diagrams showing the monthly averages for these samples from July, 1897, to February, 1900. The minimum amount of fat was obtained in March and April of each year, and again in September, November or December of one year, and August of the next. The maximum was in September, 1897, but there was a minimum in August and September, 1899. The general result of other observers is that in winter the percentage of fat is higher than in spring and summer, but cannot account for discrepancy with his results (4836-75). Of the total number of samples 6,838 came from one dairy company. These showed a monthly average minimum of 3·58 per cent. fat in July, 1899, and a maximum of 4·21 per cent. in September, 1897 (4931-46). Thinks a standard of 3 or even 3·25 per cent. fat would be easily maintained throughout the country; would be inclined to recommend 3·25, and for solids not fat 8·4 or 8·5 per cent. (4958-72). Submits a contract form in which the standard required is not less than 12 per cent. total solids, of which 3·25 must be fat (4969-77). For prosecution cases uses the Adams and Werner-Schmidt processes (5009-15). His process is based upon the Adams method and gives similar results (5075).

Marshall, Charles (2177-2273). — Is a milk-selling farmer in Northumberland, and represents the Northumberland and Durham Dairy Farmers' Association (2177-83). Gives analyses of milk from his own and other herds—comprising from 25 to 50 cows each—and particulars of feeding. In his own herd the average was 3·75 per cent. of fat. Results show generally that with heavy feeding they occasionally get an exceedingly low quality of milk, *e.g.*, 7·27 solids not fat, 2·93 fat. Milk from the same herd with the same feeding varies more than 2 per cent.—2·69 and 4·90—of butter fat within four days. Believes both these to be genuine milk, and samples fairly taken, and only

suggestion in explanation of variation is that cows had been galloping, as the weather was very hot (2188-2225). The hours of milking are 6 a.m. and 1.30 p.m. (2223-5). The analyses were all made by the City Analyst of Dundee (2254-62). Thinks samples should be taken at the railway station while milk is in the possession of the servants of the producer (2263). Would prefer to fix no standard and rely on strict police arrangements by which samples could be checked coming from the producer; if a standard were fixed would not go above 2·75 per cent. of fat (2264-71).

Maskelyne, N. Story (9970-10168).—A farmer who has a fairly good stock of cows, and keeps them fairly well, can reach a standard of 12 per cent. total solids, of which 3¼ shall be fat. If that standard were fixed a good many farmers would be below it, but in a very short time none would fall below it except from inferiority of their land, their cows, or their treatment. The middleman can adjust his milk to any standard which may be fixed. Recommends the standard of 3·25 per cent. and 8·75 other solids, or preferably 12 per cent. total solids with 3·25 per cent. fat. Section 4 of the Act is a sufficient protection to the farmer against injustice. Has been surprised at the readiness with which farmers in Wiltshire have answered him that he was right in taking this standard (9972). Statement that the average percentage of milk supplied to cheese factories and creameries in Canada is not less than 3½ per cent. Analyses of milk given by his own cows (9973-86). Proposes a higher standard of 3·5 per cent. of fat for what he would call "prime milk" (9986). Suggests that two months' notice should be given of the fixture of a standard (9989). Would suggest a standard of solids, excluding fat, for separated or skimmed milk (10027). There is now no excuse for a farmer not knowing what his cows are producing (10066-70). Thinks it should be made impossible for milk to be tampered with on the railway, and when milk is put on the train locked the producer should be free of it (10085-8). Sees no objection to the mixture of a rich and poor milk, but would not abstract cream from one to add to the other (10097-106). Land which could not produce milk up to the standard should be devoted to something else, and similarly inferior cows should be eliminated (10130-4). Is aware that at the present time town dairymen give 4d. per barn gallon more for "prime milk" with [illegible] per cent. of fat (10159). Suggests that all milk sold which did not reach the standard proposed should be so described and sold at a lower price, while "prime milk" should be sold at a higher price. But would take care that lower quality milk was pure and was not sold as standard milk (10160-2).

McConnell, Primrose, B.Sc. (3048-3180).—A dairy farmer, and represents Central Association of Dairy Farmers (3048-54). Thinks there ought to be a standard for milk, and that 3 per cent. fat and 8·5 per cent. solids not fat, or 12 per cent. total solids, however made up, would be reasonable (3055-65). Such a standard could be easily reached by 99 farmers out of every 100, and in the exceptional case the difficulty is due to unequal periods of milking (3056-7). Thinks 11 and 13 hours are the usual intervals, but in some exceptional cases 8 and 16 hours (3069). Thinks large quantities of separated milk are now used to thin down good milk. A standard of 3 per cent. will not prevent this altogether, but will prevent much of it (3073). His Association comprises 16 societies, of which seven have definitely agreed to standard proposed, and one prefers a standard of 2·75 and 8·75 (3082-3). Has had large experience of Ayrshire cows, and considers they give a medium quality milk—not so good as a Jersey, but better than a Shorthorn (3097). If 12 per cent. total solids were the standard it would not be unjust to ask for 3·25 per cent. of fat (3124). Responsibility of producer for his milk should cease when it is out of his control (3155). Does not use grains or mangolds for feeding his cows (3171-2).

Methods of Analysis.—Dyer, 426; Ashby, 1436, 1479-99, 1545-53; Stirling, 1755-6, 1831-2, 1843-54; Cameron, 2415, 2458-70; Speir, 2828; Bowler, 3351-71; Fisher, 3714-48, 3852-77, 3942-64; Allen, 4486-4505, 4597-4612; Macdougald, 4821-7, 4997-5029, 5073-5; King, 5527; Ralston, 5712-3, 5765-6; Richmond, 8303-10, 8395-8445, 8508; Bevan, 8930-7, 8961-8; Cassal, 9048-54; Niven, 9573-6; Lewin, 10566-618, 10690-3.

Middleton, Christopher (2274-2404). — Represents Central and Associated Chambers of Agriculture (2274). In April, 1895, that body resolved by a majority of 21 to 15 that standard should be 12 per cent. total solids, of which not less than 3 per cent. should be fat (2276). Great disparity between morning and evening milk. In own district business requires very unequal periods between each milking, *e.g.*, 8 and 16 hours. Possible at certain seasons for milk of well-kept cows to fall below 3 per cent. fat. Instances given of analyses of milk from own herd of 40 cows (2278-86). Case of prosecution for milk containing 4·84 fat and 7·52 solids not fat (2289-90). Personally recommends standard of 11·50 per cent. total solids, of which not less than 3 shall be fat. No reason why he, as a large producer, should not be called upon to prove milk to be genuine if it falls below this (2291-96). Magistrates have been taught by chemists that there is very little variation between morning and evening milk, and attach little importance to evidence as to this (2297-9). Milk churns on railways should be allowed to be locked (2300-9). Mixes milk of his herd before sending out, and finds no difficulty in doing so (2311-13). Obtains one penny per quart more for milk from Guernsey cows, but does not think grading milk and selling by quality is practicable (2335-40). Quality of milk can be improved by feeding to a slight extent. It is not always cows giving largest quantity which give lowest quality of milk (2346-51). To mix milk of herd is only practicable when it is sent away at once, not when refrigerated (2389-91).

Milk: General Deterioration in Quality of.—Richmond, 8554-9; 8564, 8616-7; Brown, 9878-80; Lewin, 10554.

Milk: Human.—Niven, 9566; Brown, 9821, 9908; Maskelyne, 10004-9.

Milk-sugar in Milk.—Dyer, 358; Cameron, 2625-50; Richmond, 8412-20; Lewin, 10571-7, 10583-9.

Milking, Hours of.—Hill, 18; Stirling, 1966; Marshall, 2223-8; Middleton, 2278; Cameron, 2572-6, 2587-8; Speir, 2788, 2878-80, 2956; McConnell, 3069-70; Chalmers, 3478-80; Curtis-Hayward, 4147-51, 4210-20; Drysdale, 4308, 4325-7, 4335-41, 4401-2; Pearce, 5177-9, 5226-31; Hoskins, 5289-90; King, 5409-13; Ralston, 5726-38, 5981-5; Lloyd, 6010-23; Steel, 6261, 6360-4; Stratton, 6520-1; Thwaite, 6870-7, 6964-6; Ashcroft, 7501; Walker, 7611-2; Adams, 7957-63; Long, 8069-74, 8219-26; Drinkwater, 9292-3, 9430-1; Maskelyne, 9982, 10059-63.

Milking Machines.—Drysdale, 4409-11; Ralston, 5739.

Milkers, Scarcity of.—Curtis-Hayward, 4151, 4287-9, 4403-8; Pearce, 5205-6; Lloyd, 6239-41; Steel, 6365-7; Adams, 7998-8004.

Mixing Milk.—Stirling, 1935-42; Speir, 2757-8, 2916-32; Chalmers, 3403-7, 3417-20, 3608-20; Hoskins, 5329-38; Grigg, 6652-7; Richmond, 8358-60; Maskelyne, 9986, 10097-106.

Morning and Evening Milk.—Hill, 56-9, 158; Dyer, 389, 468-88; Beecroft, 849-51; Pocock, 1409; Ashby, 1460; Stirling, 1818, 1886-94, 1925-7; Marshall, 2189-94; Middleton, 2278-86; Cameron, 2411, 2417, 2474-81, 2557-60; Carruthers, 2673; Speir, 2787-2802, 2877-80, 2956-88; Chalmers, 3392, 3583-5; Curtis-Hayward, 4128-60; Drysdale, 4307-41; Allen, 4758-77; Pearce, 5098-5130, 5152-3; King, 5407-13, 5559-66; Ralston, 5725-8; Lloyd, 6011-28; Steel, 6261-5, 6360-2; Stratton, 6522-3; Thwaite, 6830-5, 6867-73; Prideaux, 7250, 7337-8; Ashcroft, 7485-7500; Walker, 7612-8; Hoddinott, 7869-82; Richmond, 8387-94, 8513-23, 8740-2; Bevan, 8920-5; Drinkwater, 9294-6; Maskelyne, 9982-6, 10058, 10152-5; Lewin, 10563.

N.

Niven, Dr. James, M.A. (9560-9811).—Is Medical Officer of Health for Manchester. Represents the Association of Municipal Corporations, but expresses only his personal views (9560-5). The composition of human milk in respect of fat and sugar is higher than that of cow's milk; consequently it is necessary to maintain a high standard in feeding children (9566). Suggests a standard of 12 per cent. total solids and

3 per cent. fat. Prefers this to a statement of fat and solids not fat, and thinks it involves less risk of watering (9567-71). Describes the system of "control samples" adopted in Manchester, by which a milk is traced back to the farm, the reference standard adopted being 3 per cent. fat and 8·5 per cent. solids not fat. The result has been to check adulteration, the percentage of samples found adulterated having steadily diminished. In 1879-80 it was 34·3, and last year it had fallen to 2·76 (9578-9610). Would fix an absolute standard, but would give a farmer found to be actually producing milk below it, twelve months to change his stock or alter his feeding so as to come up to it (9611). Points out the possibility of a dealer evading the control system by referring to the farmer sending him the lowest quality of milk (9618-22). The system is adopted at Salford, Oldham, and other towns (9623). Suggests that it should be prescribed for adoption by all local authorities, in conjunction with the fixture of a standard (9625-6). Describes experiments made to ascertain whether the quality of milk given by a cow could be artificially reduced by particular treatment (9632-53). Does not see that a standard can be fixed for cream (9663-5). Thinks that a standard of 3 per cent. fat and 8·5 solids not fat would allow more adulteration than that which he proposes, which is not necessarily more severe (9679-82). Thinks the control system has probably had the result of producing better cows, and better feeding of them (9740-1). Whatever standard were fixed would always allow a little margin for possible error (9762-72).

Nitrogen in Milk.—*See* Albuminoids in Milk.

Notice of the Fixture of a Standard.—Drysdale, 4469-72; Macdougald, 4966-7; Ralston, 5903-11; Steel, 6273; Walker, 7622; Drinkwater, 9558-9; Niven, 9626; Maskelyne, 9988-9, 10107.

P.

Pearce, T. H. (5076-5231).—Represents the Gloucestershire, Somerset, and Bristol Dairy Farmers' Society (5076-8). The society at a large representative meeting unanimously resolved in favour of fixing the standard of fat in milk at a minimum of 3 per cent. (5079-86). Sells milk himself to a large retailing firm, and guarantees 12 per cent. of solids, including not less than 3 per cent. fat (5089-97). This is taken on the average day's supply, as the morning's milk may differ by 1 per cent. of solids (nearly all being fat) from the evening's (5098-5108). Quotes instance within his own knowledge of the regular mixing of separated milk with whole evening milk to the extent of one-third of the former (5109-17, 5131-6). If cows were milked at regular intervals the milk would not vary much, if at all (5153). Feeding makes a considerable difference both in quality and quantity (5154-5). Would be satisfied with a standard of 11·5 total solids as a minimum, with 3 per cent. fat (5165-7). If he had to milk at equal intervals he would not be able to make so high a price for his milk (5227-31).

Pocock, Sidney Job (1255-1431).—Is a wholesale milk contractor in London; has been 25 years in the trade, and was formerly a milk producer (1255-6). Believes that if a standard were fixed the public would obtain worse milk than at present. It is unfair to fix a standard on an average of samples, because prosecutions are not taken on averages, but on individual samples. Milk naturally varies enormously according to circumstances, *e.g.*, locality, drought, breed, etc., (1256). Milk in a single churn only comprises the produce of six or seven cows. There is no necessity for a cream standard. An appeal to the cow, or to the herd, is very difficult and costly (1257-61). His contract with farmers contains no standard, but stipulates for perfectly pure and wholesome milk, with all its cream as from the cows (1273-4 and Appendix No. V.) Milk received varies from 2·19 to 4 per cent. of fat (1274). There must be a standard to work to, otherwise milk cannot be analysed, but objects to an "advertised" standard fixed by the public authorities (1283-5). If, however, a standard were fixed, thinks justice would not be done if it were higher than 2·75 of fat and 8·5 non-fatty solids (1286-7). If a standard were fixed, thinks dairymen would work down to it (1290-3). Thinks analysts should use one method in analysing milk (1296). Locking churns in transit by rail is not practicable (1360-2). Thinks use of preservatives in milk and cream in limited quantities legitimate, and would not object to notify their use (1363-95). Makes a practice of never mixing morning and evening milk (1409-10). Can use the lactometer and the cream glass for roughly testing milk on arrival at the station (1429-31).

Preservatives in Milk and Cream.—Hill, 51, 123; De Hailes, 588-96, 641-3; Beecroft, 873-9; Carrick, 1063-8; Gates, 1234-9; Pocock, 1363-95, 1427-8; Ashby, 1533; Stirling, 1825-8; Chalmers, 3531-6; Curtis-Hayward, 4249-50; Prideaux, 7450-9; Long, 8117-9, 8126-31; Brown, 9892, 9936.

Price of Milk.—Hill, 296; Stirling, 1790-5; Curtis-Hayward, 4277; King, 5392-3, 5457-63, 5626-7; Steel, 6296-6300; Richmond, 8777-80; Drinkwater, 9153-4, 9230-4, 9558-9; Maskelyne, 9999, 10159.

Prideaux, Charles (7221-7481).—Is a proprietor of butter and milk factories (7221-6). Buys milk by contract with farmers. Inserted a clause stating that milk showing less than 3 per cent. fat would be paid for at a reduced price, but withdrew this because farmers considered that it was not necessary to supply milk containing more than 3 per cent., whereas 95 per cent. naturally contained more. By requiring milk to be pure and containing an average percentage of butter fat he obtained 3·75 or 4 per cent. (7234-45). Average analysis of milk from 44 farms averaging, say, 40 cows each, in March, 1900, was 3·62 per cent. fat, and in March, 1899, 3·18. Has got improved quality of milk since farmers knew samples were regularly tested (7246-82). Does not think there is much difference in milk from month to month if cows are properly fed (7270). In fixing a standard it is desirable to put it as high as possible. A low standard, say 3 per cent., would induce farmers to produce milk of only that quality, whereas now much of the milk contains 4 per cent. fat. So far as he is concerned in the country would not object to a 3·20 per cent. standard, but when milk is subject to risks of transit by rail there is difficulty. Does not think matters would be improved by fixing a standard (7285-7355, 7476-7). If a standard for cream were fixed it should not be less than 50 per cent. of butter-fat (7440-9). At the factories with which he is connected about a million gallons of separated milk are produced per annum. It goes largely to margarine factories and biscuit factories. Does not see how a standard could be fixed for it, except that it should not contain added water (7381-7, 7464-71).

Prosecutions.—*See* Local Authorities and Appeal to the Cow.

Proteids in Milk.—*See* Albuminoids in Milk.

Public Analysts.—*See* Society of Public Analysts; Analysts, Discretion of; and Analysts, Differences in Results by.

R.

Railway Churns.—*See* Locking of Railway Churns.

Ralston, William H. (5646-5911).—Represents the Wigtownshire Dairy Association and the Wigtownshire Dairy Farmers' Association (5646-50). These Associations resolved that milk should be considered adulterated if it was below 3 per cent. of fat and 8·5 of solids not fat (5651-3). Creameries in Wigtownshire buy milk by quality, varying the standard according to season, but never going below 3·4 per cent. of fat (5654-8). The cattle kept in the country are entirely Ayrshires, which give milk up to 3·4 per cent. fat easily (5659-60). Gives results of analyses of milk supplied to creameries (5561-82 and Appendix XIII.). Both the fat and the solids not fat rise as the period of lactation increases (5688). Did not lock or seal the churns in which his milk was sent by rail, but never had trouble. The milk was sent by weight (5689-99). Thinks a minimum limit of fat for cream might be fixed at 30 per cent. (5706-10). His personal opinion, and that of others, is that the standard of fat for milk might be 3·25 per cent. (5715-6). The Babcock tester is largely used. Would think it an advantage if the correctness of the bottles used were certified by a central authority (5717-23). There is not in his experience any difference between morning and evening milk, though there might be if cows were milked at unequal intervals (5725-8). It is gradually becoming difficult to get milkers. The milking is done entirely by women, who are each sup-

posed to milk 10 cows in an hour (5734-9). Thinks that if a standard is fixed a uniform method of analyses should be also prescribed (5765-6). The creameries only receive milk once a day, and consequently it is all mixed morning and evening milk. They do not refuse milk below their standard, but pay a less price proportionately (5776-82). Has made experiments to test the effect of feeding in milk production; did not find any marked difference (5792-5801, 5839-42). Producers think their responsibility for milk should cease when it leaves their charge (5846-9). Thousands of gallons of separated milk per day are sent from Wigtownshire creameries into Glasgow, but has no idea what becomes of it, except that it goes into the hands of men who deal both in new milk and separated milk (5858-63). Admits that if a standard of 3.25 of fat were fixed it would be necessary to wait some time so as to allow poor cows to be eliminated (5870-5911).

Richmond, Henry Droop (8292-8840).—Is Analyst to the Aylesbury Dairy Company, and is appointed to give evidence on their behalf (8292-7). Analyses of 6462 samples of milk from single cows (Appendix No. XXIV.) show that it would be impossible to take them as a guide in adopting a standard (8300-12). Also produces results of analyses of 76,058 samples of mixed milk, taking the churn as the unit, and calculations based upon them (Appendix No. XXIV). The figures show, speaking broadly, that the standard of the Society of Public Analysts, viz., 3 per cent. fat and 8·5 solids not fat are reasonable. During the six years covered by the tables the fat has only fallen below 3 per cent. in May and June—the lowest figure being 2·84. In September, October, November and December it is always considerably above 3 per cent. (8313-44). Attaches more importance to the fat than to the non-fatty solids in considering the limits to be fixed for raising a presumption that milk is not genuine (8345). Recommends that in the winter months the standard should be 3·2 or 3.25 per cent. fat, but in May and June it should be less than 3, say, 2.8 (8352-6). His company requires from farmers by their contracts a minimum of 3·25 per cent. of fat all the year, but in May and June they find a large number of samples of morning milk fall below this. The average percentage of fat in milk received by them during the year was in 1894 3·86, in 1895 3.84, in 1896 3·81, in 1897 3·82, in 1898 3·83, in 1899 3.74 (8366-80). Practically the results he hands in are based on morning milk, although evening milk is not excluded (8388-91). Thinks that the same method of analysis should be used by all analysts, and suggests the appointment of a committee of analysts to investigate the best method. Instances given of the discrepancy in results obtained by different methods now in use, and discussion of the method adopted in the Government Laboratory. The inequalities in the conditions under which samples are taken are of much greater importance than differences arising from diversity of methods (8395-8445). Cream may be obtained by one of three systems, viz., by centrifugal force, by setting in pans, and by the Cornish or scalding system. A standard applicable to one of these systems would not apply to the others. Thinks the public is able to take care of itself in regard to cream (8446-9). Thinks the best and most convenient standard for condensed milk would be the ratio between the total nitrogen and the total fat, and would propose that the standard for fat in condensed milk should be six times the percentage of total nitrogen. This represents a standard of 3·25 per cent. fat in the original milk, and would not object if it were put higher (8451-62). Thinks it possible that a form of starch, or perhaps a preservative such as boracic acid, might be put into separated milk to "ear-mark" it (8463-83). Would not object to have two or three methods of analysis recognised if they were found in different hands to give the same results (8508). During the past 20 years there has been a perceptible lowering of the percentage of fat in milk, due possibly to the fact that farmers prefer cows which give a large quantity, and pay less attention to quality (8554-60). Thinks food has comparatively little influence on the quality of milk, but a deficiency of food tends to lower it (8561). Suggests that in fixing a standard limits as to the amount of nitrogen and ash should be appended (8596-8603). If it is considered undesirable to have four alterations of standard in the year, would rather abandon the lowering in May and June, and only have the change from 3·25 in the winter to 3 for the rest of the year (8606). The methods he adopts are purposely intended to give rather low results (8667-74). The difference between samples taken during delivery ranged from 0·1 per cent. down to 0·5 per cent. in a churn with interior fitting, and from ·65 per cent. down to ·65 per cent. up in an unfitted churn (8678-94). Does not think the fixing of a standard will greatly affect the average quality of milk sold; it will prevent milks of very low quality being sold, but on the other hand some milks of high quality may be let down to it (8788-9). Thinks it desirable to define the limits of solids not fat as well as of fat, but has no objection to urge against a total solids and fat standard (8795-8). On only five days during six months has his company sent out any milk below 3 per cent., and then very slightly below (8806-30).

S.

Samples, Mode and Difficulties of Taking.—Hill, 196-205, 303-6; De Hailes, 626-32, 732-50, 764-6, 792-6; Pocock, 1329-33; Ashby, 1590-1612; Stirling, 1750-3; Kennedy, 1994-7; Marshall, 2232-46, 2264; Speir, 3013-20; McConnell, 3166-8; Chalmers, 3578-82; Fisher, 3924-9; Drysdale, 4445-65; Allen, 4484-5; Hoskins, 5252-8; King, 5394-7; Steel, 6460-73; Grigg, 6590-6760; Thwaite, 6815-29; Prideaux, 7432-5; Ashcroft, 7550-2; Richmond, 8676-8702, 8729-37; Cassal, 9030; Drinkwater, 9194-9203; Niven, 9577-90; Lewin, 10648-69.

Sealing of Churns.—*See* Locking of Railway Churns.

Season, or Time of Year, Effect of.—Hill, 60; Dyer, 361-3, 443-4, 451-4; De Hailes, 684-94, 729-31; Pocock, 1256-7; Ashby, 1453-60; Kennedy, 2171-4; Middleton, 2280, 2355, 2369-76; Cameron, 2417; Carruthers, 2660, 2662; Speir, 2873; McConnell, 3179-80; Bowler, 3326, 3340-3; Chalmers, 3396-3402, 3461-4, 3487-90, 3587-3604; Curtis-Hayward, 4128-34; Allen, 4809-18; Macdougald, 4850-63; Hoskins, 5238-9; Lloyd, 5954-7, 5988-6007, 6150-2; Stratton, 6553-8; Thwaite, 6793-6806, 6975-91; Smith, 7029-33, 7042-4; Prideaux, 7247-8, 7259-75, 7310, 7353; Walker, 7623-7; Hoddinott, 7667-72; Adams, 7956; Richmond, 8335-57, 8370-84, 8500-7; Bevan, 8917-21; Drinkwater, 9187-8; Maskelyne, 10010-6, 10089-94.

Seasonal Standards.—Dyer, 389; Ashby, 1509; Chalmers, 3462-71, 3629-31; Fisher, 3802-3, 3832-5, 4098-4104; Allen, 4576-82; Hoskins, 5340-1; Hoddinott, 7705-15; Adams, 7912, 7964-7, 7974-80; Long, 8095-6; Richmond, 8352-6, 8381-82, 8604-6, 8626-34.

Separated and Skim Milk.—Hill, 212-17; Carrick 1112-7, 1144-50; Gates, 1223-29; Ashby, 1527-8 Stirling, 1820; Kennedy, 2006-21, 2103-31, 2167-70; Cameron, 2529-33; Speir, 2853-5, 2884-98, 3029-33; McConnell, 3073-4, 3145-8; Finney, 3238-41; Chalmers, 3425-45, 3497-3517, 3537-49, 3651-7, 3665-80, 3684-90; Fisher, 3789-96; Curtis-Hayward, 4234-47; Drysdale, 4353-9; Allen, 4506, 4530-45, 4723-5; Pearce, 5113-6, 5158-63; King, 5388, 5485-96; Ralston, 5700-1, 5724, 5860-3; Steel, 6368-80; Stratton, 6482, 6504, 6526-9; Prideaux, 7381-6, 7464-71; Walker. 7561-8; Adams, 7925-8; Long, 8081-5, 8096, 8115-31; Richmond, 8463-83; Fisher, 8888; Bevan, 8987-9002: Drinkwater, 9250-2, 9273 8, 9297-9308; Brown, 9850-4, 9888-93, 9924-30; Maskelyne, 10027-32; Lewin, 10640-7.

Smith, Joseph Alfred (6993-7220).—Represents the East Suffolk Chamber of Agriculture and Eastern Counties Dairy Institute (6993-7). In the East of England conditions of dairying are different to those in the so-called dairy districts; the climate is not so genial, and subject to greater variations (6993-7001). Two herds of pure Red-Poll cows averaged 3·88 and 4·09 per cent. butter fat for the year. Red Polls give better milk than the ordinary cows of the district, which are cross-bred, part Shorthorn, part Suffolk, with an infusion of Dutch. Is sure they do not reach the averages mentioned (7003-7). It would be unfair to penalise farmers who have not the best cows and pastures, and do not use artificial food. If standard were fixed above 2·8 per cent. butter fat, such farmers would be caught at certain seasons of the year (7007-

8). No doubt farmers who sell milk feed their cows differently to what they would if they made butter. The addition of highly nitrogenous food would bring up the quality of milk. It increases both the fat and the non-fatty solids—the latter especially. An unskilful milker, or a change of milkers, will affect the quality of the milk given by a cow (7014-20). When cows are first turned out to grass there is a great increase in the quantity, and a corresponding decrease in the quality of milk (7031). Would like to see milk sold according to quality, but does not think farmers now would agree to this (7043). Thinks that a standard of 3.2 per cent. could not be reached even by higher feeding and improving the breed of cows. Certain land would have to be given up for milk production (7052-72). The Red Polls would yield 4 per cent., but the general average would not exceed 3 (7075). The Scotch farmers who have taken poor land in the Eastern counties produce milk, and have managed to keep within the present standard; they have principally Ayrshire cows, some of them crossed with Shorthorns (7124-49). If 12 months' notice were given of fixing a standard it would mitigate the hardship (7162-3). Thinks it impracticable to have different local standards (7213).

Society of Public Analysts.—Dyer, 330-3; Ashby, 1436, 1481, 1513, 1613, 1646; Cameron, 2413, 2454-67; Fisher, 3712-4122; Allen, 4583-602; Richmond, 8335, 8401; Bevan, 8909-16, 8951-5; Cassal, 9015, 9030, 9048-9, 9069-73.

Somerset House Standard.—*See* Government Laboratory Standard.

Sour Milk Analysis.—Ashby, 1491-9, 1520-6, 1656-1702; Cameron, 2620-57; Fisher, 3891-3923; Grigg, 6665-6; Brown, 9931-7; Lewin, 10570-618.

Speir, John (2693-3047).—Represents the Highland and Agricultural Society of Scotland (2693). Submits results of his experiments in the effect of food and treatment of cows on quality of milk (2695). It is not possible to alter, for any appreciable length of time, the quality of milk by feeding (2696). Is instructed by Society not to recommend any standard below 3 per cent. of fat. If owners of all milk below standard are to be prosecuted, would not go further than this; but if owners have means of appealing to cow or other "buffer" between prosecuting agent and court, would go up to 3·2 or 3·25 (2700-17). Average over two years in feeding tests with Ayrshire cows was 3·74. Does not believe in alleged poorness of Ayrshire cow's milk (2718-23). Suggested methods by which milk producer might clear himself from imputation of adulteration (2728-51). If a farmer had reason to suspect that his milk was irregular, it would devolve on him to make provision for mixing it (2758). It would be a great advantage if bottles used in centrifugal testing machines could be standardised by the central authority (2759). Thinks the feeling of farmers in his district is to agree to a high standard provided suitable provision is made for any abnormal case that may occur (2765-6). Has heard no expression of opinion in favour of selling milk of different grades (2767-8). No difficulty in fixing a standard for cream. Should be not less than 10, and not over 20 per cent. of fat (2769-70). The quantity rather than the quality of milk is affected by difference of pasture (2777-8). If milkings are at equal intervals there is very little difference in the quality of the milk; in some cases has found the morning's milk richer than the evening's. Where intervals are unequal a difference of 0·2 to 0·3 per cent. of fat, and at extreme inequality—say 8 and 16 hours—more (2787-2802). Has supplied a good number of retailers of milk during the past 25 years, and in no case did they retail the milk as they received it (2841-5). Separated milk goes in extraordinarily large quantities to Glasgow (2853). All cans passing out of a farmer's hands should be lead sealed (2860-2). The poorest milk is given by cows during the first week or two they are on grass (2873-4). The poorest milk obtained in his feeding tests was given by cows fed on grains and grass only (2936-9). With milking intervals of 8 and 16 hours, the difference between morning and evening milk would be something like 0·75 per cent., or 0·50 per cent. at any rate (2956-77). System of milk supply in Copenhagen described (2995-3011). Rapidity with which cream rises (3013). There is as much necessity for a standard for cream as there is for milk (3021-6). The quality of milk as determined by public analysts is likely to be lower than higher than the truth (3035-7). The fixing of a low standard might easily make matters worse than at present (3045).

Standard (or Limit) for Milk, Advantages or Desirability of.—Dyer, 427-8; De Hailes, 599-617, 757-60, 783-96; Beecroft, 801-8; Carrick, 981; Pocock, 1256-7; Ashby, 1436; Stirling, 1875-7, 1897-1906; Marshall, 2264; Middleton, 2291-3; Cameron, 2411-17; Speir, 2808-15, 2865-72; McConnell, 3055; Finney, 3184-98, 3214-Fisher, 3749, 3761-8; Curtis-Hayward, 4140-5, 4171-3, 4427-37; King, 5364-72; Lloyd, 6009-11; Stratton, 6482-6505, 6530-9; Thwaite, 6802-7, 6883-6903; Smith, 7052-7102; Prideaux, 7302-47, 7472-8; Ashcroft, 7494-7, 7508-16, 7524-7, 7544; Walker, 7558; Hoddinott, 7704-5; Adams, 8048-51; Long, 8085-91, 8108, 8168-75; Richmond, 8562-9; Bevan, 8955; Cassal, 9015; Drinkwater, 9226-33, 9414, 9422-5, 9552-9; Niven, 9626; Brown, 9812, 9832-6, 9857-65, 9952-6; Maskelyne, 9972; Lewin, 10670.

Standard (or Limit) for Milk.

(a) *Of Fat:* Hill, 19, 40-6, 49, 61-5; Dyer, 328-38; 346, 354-65, 398, 400, 408-22, 490-516, 547-78, De Hailes, 607-9; Beecroft, 813-21, 868-71; Carrick, 980-91, 999-1008, 1030-58; Gates, 1165-79, 1203-18; Pocock, 1256-90, 1322-51; Ashby, 1436-73; Stirling, 1739-42, 1774-1818, 1855-1914; Kennedy, 1993-8; Marshall, 2188-2202; Middleton, 2276-93; Cameron, 2411-2518, 2561-2609; Carruthers, 2660-92; Speir, 2699-723, 2760-6, 2782-6, 2806-15; McConnell, 3057-9, 3106-25; Bowler, 3315-36, 3353-68; Chalmers, 3382-3407, 3456-76; Fisher, 3714-49, 3754-6, 3843-7, 4032-4122; Curtis-Hayward, 4128-44, 4156-60; Drysdale, 4293-4334; Allen, 4506-10, 4561-3, 4653-710, 4737-97; Macdougald, 4831, 4849-996, 5051-71; Pearce, 5079-5130; Hoskins, 5234-9, 5260-5341; King, 5373-81, 5389-90, 5474-9, 569-78, 5601-24; Ralston, 5652-88, 5714-6, 5870-5911; Lloyd, 5916-57, 6029-91, 6190-6210; Steel, 6261-6337; Stratton, 6493-6504; Thwaite, 6883-90; Smith, 7024-8, 7032-41; Prideaux, 7234-7355, 7472-81; Ashcroft, 7494-5, 7550; Hoddinott, 7662-3, 7707-10; Adams, 7912-19, 8037-47; Long, 8056-68, 8092, 8176-8, 8233-45; Richmond, 8302-11, 8317-86, 8562-94, 8611-5, 8637-8717, 8805-31; Bevan, 8917-28, 8951-6, 8969-74; Cassal, 9015, 9019-26, 9043; Drinkwater, 9121-9, 9173-9214, 9243-9, 9264-72, 9340-68, 9375-81, 9457-66; Niven, 9570-1, 9576-8, 9591-9614, 9672-82; Brown, 9813-36, 9897-8, 9957-61; Maskelyne, 9972-10026; Lehmann, 10345-6, 10461-4, 10473-81, 10491-500; Lewin, 10547-65, 10670-90.

(b) *Of Solids not Fat:* Hill, 40; Dyer, 228-38, 346, 354-65, 397, 403-22, 490-516, 547-78; De Hailes, 607-9, 656-66, 675-6; Carrick, 982-4; Ashby, 1436-7; Stirling, 1904-9, 1953-5; Marshall, 2188-2192; Middleton, 2276-91, 2403; Cameron, 2411-2518, 2561-2609; Speir, 2846-8; McConnell, 3057-9, 3107-25; Bowler, 3315-33, 3353-68; Chalmers, 3382-3407; Fisher, 3714-44, 4036-4122; Curtis-Hayward, 4128-44; Allen, 4546-52, 4561-3; Macdougald, 4869-74, 4960-72; Pearce, 5165-6; King, 5373-80, 5601-10; Ralston, 5652, 5688, 5715; Lloyd, 5916-57, 6029-91, 6190-6210; Steel,, 6261-6337; Thwaite, 6883-90; Smith, 7208; Ashcroft, 7550; Hoddinott, 7708-14; Adams, 7920, 8041-7; Long, 8062-3; Richmond, 8595, 8645-9, 8706-7, 8714-7; Bevan, 8969-74; Cassal, 9015, 9021-26, 9043; Drinkwater, 9173-90; Niven, 9567-71; Brown, 9835; Lehmann, 10461-5, 10486-9; Lewin, 10547-65, 10673-89.

(c) *Of Total Solids:* Hill, 19, 39-42, 49; Dyer, 354-65, 403-26, 490, 547-78; De Hailes, 664, 675-6; Ashby, 1436-7; Stirling, 1743, 1803; Middleton, 2276-91, 2404; Cameron, 2411-2609, 2561-2609; McConnell, 3058, 3107-25; Chalmers, 3382-3407; Fisher, 3714-44, 4039-4122; Curtis-Hayward, 4128-44; Allen, 4683-710; Pearce, 5089-5144, 5214-7; King, 5377, 5606-12; Lloyd, 5916-57, 6029-91, 6190-6210; Steel, 6261-6337; Adams, 7968-71, 8044-7; Long, 8092-3; Richmond, 8791-8; Bevan, 8969-74; Niven, 9570-1, 9596, 9600, 9611-4, 9673-81; Brown, 9835; Maskelyne, 10040-6; Lewin, 10685-9.

Standardising the Vessels of Centrifugal Milk-Testing Machines.—Speir, 2759, 2830-3; Fisher, 3948-50; Ralston, 5722-3; Prideaux, 7416-9.

Steel, Alec (6257-6479).—Represents the Eastern Counties Dairy Farmers' Co-operative Society (6257). Submits result of 27 analyses of milk taken from dairies belonging to the society showing an average of 3·94 per cent. fat, and 8·89 per cent. solids not fat (6259-69). Also results of 382 analyses of milk taken at London stations by society, showing an average of 3·34 per cent. fat, and 8·91 per cent. solids not fat (6270). Society recommends a standard of 3 per cent. of fat, and 8·50 solids not fat, or of 12 per cent. total solids, but personally would suggest 3·20 fat and 8·80 solids not fat (6270-2, 6289-94). If better milk were produced than at present the quantity would be reduced, and farmers would take their chance of securing a higher price (6295-6300). Some people do not think they are adulterating milk if they abstract cream so long as it passes the Government standard (6321-4). Brewers' grains and mangolds are used generally in his county. Believes that to improve quality of milk you must breed to it, and to improve quantity feed to it (6340-7). A difference of 1·50 per cent. fat is shown when milkings are at 4 a.m. and noon, but if the intervals are regular there is no difference. There would be no difficulty in arranging to milk at regular intervals (6360-4). Does not think farmers would have difficulty in supplying milk with 3, or even 3·20 per cent. fat. (6383-8). Does not agree that Ayrshire cows give poor milk; their average would be rather higher than Shorthorns (6452-8).

Stirling, James (1710-1982).—Is secretary and manager of Glasgow Dairy Company (1710). There are great differences between analysts. Instances of divergent analyses by three different analysts of same milk (1713-38 and Appendix No. VII.) Considers a standard of 3 per cent. fat would be an injustice (1741). Differences in analysis of same milk by the same analyst (1757-66). Cannot state instances of prosecutions wrongly brought through inconsistencies of analysis, but cites instance of case being dismissed in consequence of two analysts giving different results in court (1767). Gives results of analyses of samples of milk of single cows and of herds (1774-1818 and Appendix No. VIII.). Thirty samples are of milk supplied to a factory morning and evening mixed, and of these 9 fell below 3 per cent. of fat at some period of the year (1779-88). The samples were lowest in fat in January and February (1789). Suggests that if cows yielding milk low in fat were compelled to be put out compensation should be given (1810). Morning's milk is poorer than evening's (1819). Preservatives are used for cream in Scotland, but prefers pasteurisation both of cream and milk to the use of preservatives (1825-8). Some of the samples referred to as showing discrepancy of analyses were made by an analyst using a special system of rapid analysis. There was no indication to the analysts that the results were required for any particular purpose. Does not allege that the results were unfair or careless (1831-52). It would be dangerous at present to fix a standard for fat above 2·75 per cent. (1855-1910). The range of variation between morning and evening milk is considerable (1887-94). Is not prepared to suggest a limit for solids not fat (1909). It would not be easy for a producer to prove that milk was sold as produced by his cows (1928-33). In his business all milk received is mixed together before distribution, but another practice prevails of delivering individual churns to retail vendors as they arrive (1935-8). There are many holders in Scotland who do not own more than four cows (1947). Under the present Act the trade is protected by a warranty so that the onus is now borne by the farmer (1950-1). Does not think a standard based on English experience would apply to Scotland on account of the number of Ayrshire cows (1958-60). Would fear prosecution under a 3 per cent. standard (1973-9).

Stratton, James (6480-6583).—A dairy farmer, owning about 200 cows and farming 6,000 acres (6480-4, 6572-5). A fairly high standard for milk desirable for the sake of protection against the mixture of separated milk with whole milk, which is very damaging to his trade. Thinks also there should be protection for the man who sends pure milk, but below the standard. Is not inclined to dogmatise upon exact figures, but thinks the standard might be fixed at about 3·25 per cent. Thinks the trouble to farmers from a high standard would be much less than the damage now done them by the competition of separated milk. Has never had any complaint as to the quality of his milk, although he keeps Shorthorns which, with the Ayrshires, give almost the lowest quality of milk (6482-6505). Thinks milk should be tested at the departure station, as it is impossible to know what may happen to it on the railway (6544). Can arrange the quality of milk by the food, but in large herds kept for milking purposes, extremely poor milk will not be found. Times of drought affect the quantity of milk, but the quality is rather higher (6542-56). Ayrshires are not rich milk producers, and he would cross them with the common Shorthorn (6568). Approves the wording of Section 4, and under it would not be afraid of the standard he suggests (6581-3).

"Strippings."—Drysdale, 4317, 4342-7; Smith, 7020; Prideaux, 7260; Long, 8074.

T.

Thwaite, C. F. (6788-6992).—Represents the Metropolitan Dairymen's Society (6791). Milk varies so much that it is difficult to fix a standard that will be at all times just to the producer and retailer. To produce healthy milk it is desirable that cows should be kept in the open all the year round, but exposure to weather causes great changes in the milk. Quotes analysis of milk from a herd of 26 cows, showing 4·2 of fat and 8·27 solids not fat (6793-6801). The Society does not advocate a fixed standard, but that it should be a standard of purity as from healthy well fed cows (6802-4). Difficulty in "appealing to the cow," as great changes of weather, affecting the cows, may take place. The expense would also be considerable. Difficulty in maintaining the exact condition of milk while in course of sale. It is impossible to mix morning and evening milk, as the milk goes sour (6805-33). Believes some of the milk coming to London is adulterated (6838-42). The London trade does not permit of having cows calving regularly throughout the year, as it is necessary to keep the milk supply short in August, and part of September (6862-6). Cannot say there has been any great hardship or outcry on account of the rigour of the standards hitherto applied to milk (6883-94). If arrangements were made for an immediate "appeal to the cow" when a milk was questioned it would be a good idea. Admits that there must be a standard somewhat from which the "appeal to the cow" starts. Suggests personally that samples should be taken regularly at intervals, the results being sent to the vendor of the milk, but no action taken until the end of the year, and he should then be judged on his record for the twelve months (6913-56).

Time of Year.—*See* Season.

V.

Variations in Existing "Standards."—Beecroft, 813, 857-63, 887-95; Niven, 9777-9.

W.

Walker, F. E. (7553-7657).—Is agent to Lord Wenlock, and has managed his dairy factory for ten years (7553-6). Great variety in milk as at present produced, ranging from 2·4 to 5 or 6 per cent. of fat. Tendency has been to deteriorate the dairy herds of the country. If standard were fixed too low this tendency would go farther (7557-60). Milk rich in fat is commonly reduced by adding separated milk. Separated milk with cream added can be sold at a lower price than so-called new milk (7560-8). Thinks a standard of 3·4 per cent. of fat would represent the bulk of the milk produced all the year round from fair herds of cattle. Suggests that milk should be sold in three grades with the minimum limits of 2·4, 3·4, and 4·4 per cent. of fat respectively. Some notice should, however, be given before fixing such limits. Thinks that 3·25 would be too high, at all events to start with, as a general standard (7569-99). In a mixed herd the difference between morning and evening milk with intervals of 10 and 14 hours would be about 0·4 per cent. of fat (7611-18). Puts the whole of the yield of butter-fat down to breed, and quantity of milk to mode of feeding (7624-9).

Warranty Under Food and Drugs Act, 1899.—Stirling, 1950-2; Hoddinott, 7745, 7817-20, 7862-3; Maskelyne, 10139-41.

Weather, Effect of.—*See* Season.

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